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DEC. 20, 1954

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Phillips 66

PRESENTS

MILESTONES IN AVIATION

From Homemade Plane to Pilotless Bomber



The Navy's new Martin P-51A-2 anti-submarine airplane is equipped with the latest electronic devices for detecting submarines in all weather. It carries variety of torpedoes, rockets and mines, and has a self-sealing gas tank.



66

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from M O N O G R A M



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December 20, 1954

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Washington Roundup

Feeder Push

Looked like a powerful thrust by local service interests at the next session of Congress to obtain through legislation and congressional pressure permanent Civil Service (civil) division classification and a more favorable formula for computing schedules.

After squabbling legislation in the Senate last session for permanent classification, the Administration has returned to Congress to seek a more formal permanent classification for some of the feeder. Strategy of the local service leaders will be based on the necessity for attracting assistance, getting off subsidy payments sooner.

Missile Pot Boiling

Washington observers see widening while the USAF missile development pot boil over. Between successive USAF and missile consultants on intercontinental ballistic missile developments are heavily assisted by a military security blanket, but odds are that they will erupt into public debate soon after Congress returns to Washington.

Shooting War

Assessments are made easier on the fringes of the Iran Crisis as becoming increasingly restricted by the growing number of incidents involving Iranian fighters shooting down USAF and Navy aircraft.

Don't be surprised if there is more shooting back of the Persian attacks as the Iranian claims the power of the Navy carrier-based aircraft that bombed two Red Chinese cities and British transport plane operations in South China Sea. Instead, it is likely Arab and Canadian aircraft are moving through the same space on all sides of the Iran Crisis as easily underestimated by the public.

Where Was USAF Brass?

USAF brass was conspicuous by its absence at the launching of the Navy's first supercarrier, the USS Forrestal, Dec. 11 at Newport News, Va. Although many VIP military transports made the short hop from Washington with Defense Department, Navy and Army brass, the only high ranking USAF official to show was Gen. Otto F. Weyland, Tactical Air Force Commander.

MATS Organization

An Air Force committee to assist Congress in Defense Department to organize the Military Air Transport Service as an informal hand-ham circle in the MATS era. The Air Force's role in the Air Force agreement is that it would only increase paperless involved in changing other elements of the Air Force for MATS service.

MATS was also the object of criticism from a House appropriations committee which complained over the assignment of such tasks as Air Rescue Service, Air Weather Service, News and Air Communications Service to MATS.

Consequently, that USAF division had taken MATS by leapfrog in acquisition of providing air transportation for defense agencies. MATS probably will have the name change from the new Congress.

A TRUE STORY OF AIRWORK



THE PRESIDENT DROVE THE TRUCK

The phone call came through long after the plane closed, and all but the executive staff had gone home. That was over six hours ago. Now, it was midnight on a dark and lonely mountain road.

One more curve in the endless series of split turns. Then the headlights picked up the small airstrip—the crimped plies—the anxious looking men waiting in front of the hangar.

Airwork was delivering an overhauled engine to a customer in trouble. The president drove the truck over 200 miles that night. Like every man in the company, he was taking his place in Airwork's tradition of Personal Service to the customer.

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WHO'S WHERE

In the Front Office

John B. Johnson, a president of the recently incorporated Avionics Co., will step up to the top job at Avionics, Inc., his company manager within the aircraft industry.

Col. J. G. Vicinus, redesignator of the first aircraft engine with parts manufactured for mass production and the first plant to power a plane, has retired as vice president-engineering of Pratt & Whitney Aircraft. (See "Aviation Week," Dec. 15, p. 16.)

Allen D. Meadell has assumed vice president management planning and secretary of Convair Dynamics Corp., New York.

Reggie C. Shaeffer has been appointed vice president in charge of the new West Island Division of Midwest Aeroplane Co., Calif. New works manager: Robert J. Tolson.

Roy M. White, co-founder of Frontier Airlines, has sold his interests in the company and stepped as chief of operations.

Changes

Mr. Gen. William L. Richardson (USAFA, Ret.) has become manager of defense prep. and coordination for Kubra Corporation of America's Engineering Products Division, Crosson, N.J.

John F. Taggart has moved up to general manager of Klein Manufacturing Co.'s Commercial Products Division, who will be general manager of the Disney, Calif., plant.

Dr. Neil W. Lamb has been appointed manager planning administrator for Convair's aircraft division. The San Diego company has discontinued its aircraft production plan.

Robert H. Innett is now chief engineer of Boeing Ingalls Co.'s Protection Aircraft Division at Seattle. Other changes: George L. Ladd, formerly manager of the W. R. Cook plant, has joined newly organized jet craft. Donald W. Fidley, start of World Surveyor design for the Seattle Division.

Dr. Elmer F. Neugebauer, World War II pilot manager of Germany's Akaflieg Berlin team, has completed his research program at Wright-Patterson AFB and has been named consulting engineer for thermal studies in Convair's Aerotherm Co.'s engineering laboratory at Edwardsbury, N.Y.

Honors and Elections

H. M. Horner, president of United Aircraft Corp., has been elected chairman of the board of governors of Aircraft Industries Assn. for the first half of 1953. J. G. Garrett, president of Garrett Corp., is chosen for second half.

Robert E. Gossen, president of Lockheed Aircraft Co., has won the Los Angeles Advertising Club's "Mercury Award" for "outstanding programs in advertising."

James Lohman, managing director of Flight Safety Foundation, Inc., has invited the Jr. G. A. von Braunhead Foundation Board, world by the Royal Netherlands Aero-Club for "the most valuable contribution to flight safety."

INDUSTRY OBSERVER

Pan American World Airways is expected to sign the first contract soon for Boeing's commercial jet transport based on the 260,000-lb gross KG-135 military tanker. PAA would use the Boeing jet transport for nonstop trans-Atlantic service. Prospect of competition with British Overseas Airways Corp. has led Pan American's assault on the Douglas DC-7D powered by Rolls-Royce R.B. 109 turboprops.

Pratt & Whitney Aircraft's Astroline Engine Research Laboratory will be built on a 1,180 acre tract near Middleboro, Conn., about 30 miles south of the main P&W plant at East Hartford. Construction on the \$1-billion facility is expected to begin late in 1955 with design of the first laboratory scheduled for completion by next July. Design is being done by the New England division of the Army Corps of Engineers, Boston, Mass. USAF is financing the laboratory.

Fist of supersonic fighters, a Lockheed F-104 whose structure was designed and built in the light-weight metal by East Coast Aerocrafts, Poughkeepsie, N.Y., a subsidiary of Republic Steel, is at MacDill AFB for pre-flight inspection. The plane will make its first flight early in January.

Lockheed expects that its L-144 turbojet-powered Super Constellation will be able to beat the block speed of the de Havilland Comet 3 between New York and Paris. The TH-40-powered Canuck will be able to make the flight nonstop, while the Comet 3 will require at least one scheduled stop.

Gummere expects to flight test the first transport version of its XIF transport aircraft sometime within year end next year. The transport version will be slightly convertible to carry either eight passengers or more than 5,000 lb of cargo and will replace the DAF converted torpedo bombers now used as the "oddballs" which maintains communications between anti-sub corners of sea and land bases.

Tonsile which led to grounding of North American Aviation's F-100 has been attributed to a lightened rear encounter at speeds over Mach 1 which induced the aircraft to seat itself well beyond its design limit. The Super Sabre, in which NAA test pilot George Welch was killed, was heavily instrumented and more than half of these instruments were recovered intact. Company and Air Force investigation into the cause of crash is continuing, while the F-100 remains grounded.

de Havilland Canada, supersonic turboprop, will make its first flight in a modified Short S.20 Sparrow. Modification of airplane concept is being made at Shorts plant.

Curtiss-Wright Corp. has developed an airflow modulator to prevent excessive nacelle blade vibration at low speeds, so putting the new device on J47 engines now ending off the line. The unit costs only at \$3,000 apiece, goes the air into the slots of the compressor stages and then is cut out at 6,500 rpm.

Pan Am's Sikorsky Corp.'s first YH-36, twin engine 46-passenger helicopter powered by 740-hp Klimovs, has completed its structural flight testing. The weight less than 15,300 lb. on the strength over the first flight more than a year ago. The YH-36A, powered by two Allison T33 turbine engines, a ground map stand with more than 20,000 lb of ballast in cold, ready for first power tests.

Douglas Aircraft has a new Navy contract for an aircraft designed by its El Segundo Division's chief engineer Ed Heineken that will supersede both the F4D and A4D in performance.

ERUP 4, Fessells' single-seat helicopter powered by a Wright R-1300 engine replacing Continental R-775, will make its first flight before Jan. 1. First aircraft will use only 60% of 300 hp available. Second HUP-4, which will be ready early next year, will suffice full 300 hp.

Defense Directive Muddles Buying Picture

- Wilson's order for 'sound mobilization base' in armed forces procurement touches off confusion, criticism.
- Top officials ordered not to interpret document, are given 30 days to revise buying procedures.

By Claude Wissie

A major muddle appeared last week in Defense Department procurement circles because of a new directive issued by Defense Secretary Charles E. Wilson, ordering the services to focus on plans to plan their buying to establish a "sound mobilization base."

The order, which was issued after the three-day war games at Fort Monmouth, was designed to end confusion which officials at high levels were creating to develop the concept publicly or attempt to explain it.

Flood of inquiries—In addition, there was a possibility the directive violated the Small Business Administration Act of 1953, under which a federal agency may be required to "consult and cooperate" with SBA on procurement policies.

The Wilson directive was issued unobtrusively after close of the annual business day. One newspaper pointed only the text of the directive and the fact it had received 400 requests from members of Congress for explanation.

Major questions:

- In this directive an actual change of military buying policies is a substance of existing law designed to help buyers in time of war?
- In planning procurement, the directive says, efforts must be paid to "financial mobilization supplies." How does a supplier fit in this category?

Precise officials in the Pentagon, advised not to attempt interpretation of the directive, fell back on two paradoxical replies:

- The purpose of the directive, as stated in the text, is "to mitigate" policy with mobilization plans. Those referring to the directive discounted the point by the fact that there will be no change in procurement policies.
- The other reply is to revise regulations, procedures and instructions to carry out the new directive. It is too early to discuss details.

Principles—Correspondence to the new directive from members of Con-

gress was equally diverse. Sen. Henry M. Jackson (D., Wash.), who had endorsed Secretary Wilson for leaving large companies, particularly General Motors Corp., behind the new order, called it a "significant contribution to U.S. security."

Sen. Edward J. Thye (R., Mass.) expressed similar concern about the directive. He interpreted it as an order to set up a list of preferred firms to receive a sound mobilization base.

Planned—The order, "The Order to Amend the Defense Mobilization Order DMOO-VII-2," was issued. Most significant of the order was dated Nov. 24 and concerned an deletion of one sentence from the original. The sentence:

"The general policy in case where supplies also are part of the mobilization base is to make available to combat necessities on a full basis shall be to insure maximum utilization of the capacity to determine if the capacity can be augmented without reducing at high cost problems."

Precise effect of the changes would be to permit the sound base to pay premium prices for stores. This is necessary to let in a mobilization supplier irrespective of one of the major costs listed in the Wilson directive of Dec. 7.

The Senate Small Business Committee had understood that Wilson foresaw upon the meeting of roving trade to other than low bidders. In view of the participation of the DDM and Wilson's order, a spokesman said last week, "We now wonder which is the civilian and which is the war?"

Small firm threat—Both industry and Pentagon sources indicated that military buyers have been making a practice of placing priority procurement contracts so that they could be threatened by going to the low bidder. Then in the school of thought that saw Wilson's policy directive as a preventive measure whose purpose is to ease the problems in these cases.

Opposition to the Senate Small Business Committee, as expressed by Sen. Thye in a telegram to Wilson, was

Mary and Air Force to review proposed procurement of stores on the Defense Department's preference planning list, with coordination to:

- Maintaining multiple sources of supply;
- Geographic dispersal;
- Avoiding undue concentration of contracts in a few leading suppliers;
- Multiple awards;
- Preserving essential skilled labor force;
- Utilizing existing open industrial capacity;
- Preserving essential management or managers and "know how";
- Maximum subcontracting;
- Any other factor relevant to maintaining a sound mobilization base.

Planned—The order, "The Order to Amend the Defense Mobilization Order DMOO-VII-2," was issued. Most

significant of the order was dated Nov. 24 and concerned an deletion of one sentence from the original. The sentence:

- that the new order may be a threat to small firms who are a "mobile and potent productive force in times of emergency";
- questions put to Wilson by Thye:

- Was the Small Business Administration consulted in the preparation of lists of control suppliers as provided in the Small Business Act of 1953?
- How can mobilization bases be established without bidding?
- How will the directive affect the Joint Defense Production Program of the Defense Department and SBA?

- How will it affect the small business programs of the military departments?
- To what percentage of defense contracts, by volume and by dollar value, will the new policy apply?

The second point was disturbed by a clause in the directive that calls for avoidance of all repeated contracts under terms of the Armed Forces Procurement Act. It also took cognizance

of price recognition.

The Wilson directive stated that



WORLD'S LARGEST AIRCRAFT CARRIER, USS Forrestal, is tugged to dock for fitting

CAB Blames Tower
In Convair-SNB Crash

Collision—An American Airlines Convair and a Navy SNB (one 27 at California, one 62 at the Bureau of the Port Columbus Airport) came in contact properly the traffic situation, said American Board report.

The Navy aircraft crashed at the airport, killing both occupants of the airplane.

The Board found that the probable cause of the collision was "a traffic control situation created by the tower local controller which failed to observe the necessary air traffic control procedures."

Failure of both crews to detect the situation through visual vigilance is listed as a contributing factor.

The accident occurred just after sun down when both aircraft were instructed to land on the same runway, and the tower allowed them to make their approaches almost simultaneously. After observing the position of the approaching aircraft, the tower advised the Navy plane either to make a 360-degree turn or make an emergency landing on the adjacent to the fast track. The Navy plane decided to make a 360-degree turn.

The Navy aircraft caught fire on impact, crashed and burned. The Convair landed safely, but the nose wheel collapsed during landing, resulting extensive damage. None of the Convair passengers or crew was injured seriously.

Forrestal Specs

Length	9,056 ft. (equal to five city blocks)
Height	Rod to mast-top equal to 15 story buildings
Width	212 ft.
Displacement	58,600 tons
Propulsion	250,000 shaft hp
Speed	30 kts.
Flight deck area	4 acres
Crew	1,500 (including air group, March 113 pt fighters and attack bombers)
Caterpillar	4, steam-driven
Electrons	4, dual-edge type.

built at the Brooklyn Navy Yard and the Ranger (CV-41), she under construction at Newport News. The fourth supercarrier (CVN-62) will be built at Brooklyn and funds for a fifth will be contained in the fiscal 1958 defense budget.

Carriers—The Navy has its eye on the largest World War II aircraft carrier, as the first of a series of 10 supercarriers planned by the Navy as new "ships of the 20th" for atomic power at sea.

The Forrestal (CV-59) will be joined by the Saratoga (CV-63) being

assembled at the Brooklyn Roads, seven feet to stern to stern to accommodate high deck clutter in the anti-submarine warfare between USAF and Navy over the oblique mouth of Long Island Sound.

At the first of the supercarrier wave, the Forrestal is destined to bear the brunt of extreme aerial and naval aviation risks in atomic warfare.

Appearance of the Forrestal on the waters of Hampton Roads serves only to stimulate fresh debate in the anti-submarine warfare between USAF and Navy over the oblique mouth of Long Island Sound between Bremerton and Everett.

Forrestal Features—Although units of the 12,800-ton Essex class carriers have been converted to meet catapult and arrested deck requirements of operating carrier, lengthened at midship at 100 ft., the Forrestal is the first carrier designed from the start to meet the operational

needs of the sequencing, landing jet fighters and bombers steadily calling for and getting fast favors for service to the U.S. Navy.

New features of the USS *Intrepid* which affect its aircraft operations include:

- Flight deck. The present flight deck is approximately four feet wide. In contrast to earlier decks that was imposed as top of the ship's structure, the *Intrepid's* 114-ft steel plate deck is an integral part of the ship's structure.
- This type structure is necessary in order to stand the heavy pounding of jet plane landings and the hot blast from takeoffs.

The *Intrepid* also has a control flight deck, which, combining landings to be made and takeoff, the island structure, two and forward deck load of aircraft. A 33 ft. overhang on the port side is necessary to provide the control landing area.

• Status catapults. Four status catapults are installed on the flight deck with two operating over the bow, one off the control flight deck. This permits simultaneous landings from both areas, enabling the air group aboard to get its planes in the air faster. The status catapults

make it necessary for launching the new Navy jet attack planes, such as the F-8U and the Douglas A-4.

• Engine room. From the largest engine room built for a carrier, the rooms are located on the deck edges of the forward-deck on the starboard side, one on the port. The type elevator permits greater structural integrity for the flight deck than the old steel deck elevation, and allows the planes coming up from the hangar deck to be fed directly into the forward catapults. Each of these 165 ton elevators has a plan from 52 to 62 ft.

• Hangar deck. Size of the hangar deck has been increased to accommodate both the larger jet aircraft selected for Fleet-type carriers and that to be used by the carrier-based assault group required for more complex planes now used by the Navy.

• Assault group. A new assault group operating plan has been designed for the *Intrepid* class which is capable of launching a 70,000-lb assault landing at a speed of 190 mph in a space of 150 ft.

The *Intrepid* will be delivered to the Navy late next year and will enter fleet service complete with an air group in 1950.

Aircraft Strike Threat Rises on West Coast

Los Angeles-Virtually all strikes on the West Coast during military aircraft shot down recently last week.

Workers at the Douglas Aircraft Co. in Santa Monica followed the lead of fellow employees at El Segundo in accepting a new contract. North American Aviation, Inc., matched an agreement with United Auto Workers (UAW), Northwest Aircraft, Inc., announced wage increases for its employees. Negotiations at Lockheed Aircraft Corp. and Convair were reported to be proceeding smoothly.

• **Fiat Frosimino Plan.**-North American's agreement provides for the first major pay increase since the end of the War in Korea. The plan covers hourly and overtime rates set at \$5 and has completed at least 10 hr. of crediting service. Details of the provision still are to be ironed out.

UAW-CIO president Walter Reuther's administration assistant Jack Coro was says, "It is planned that General Motors' pay plan" and believes it superior to any new agreement in the aircraft industry.

NAK's rate agreement also provides for an average increase of 5 cents an hour, bringing hourly minimums and maximums up to \$8.50 and \$2.50.

• **5 to 7 Cent Plus-Lodge.**-The International Association of Machinists (IAM) members continuing collective bargaining contract during the 7 years have been granted during the past three years freight benefits at Douglas Santa Monica.

The contract was similar to one as copied Dec. 5 at the El Segundo plant (AVIATION WEEK Dec. 15, p. 15). The Santa Monica agreement covering 14,000 workers went into effect Dec. 13 and will expire April 1, 1950.

Saginaw machinists have had renewals since Sept. 1.

• **SAF**.-William Boeing-Northwest president, William C. Cotton, announced wage increases averaging 4 cents an hour for 16,750 employees. Increases and minimum hourly scales also were increased.

The new wage scale, which went into effect Dec. 15, adds \$2.5 million a year to the company payroll. Cotton said Northwest workers are not union.

The pay raises will apply to all Northwest plants in California and Florida.

As indicated by past history of our negotiations, it is not at all unusual at this stage to have a number of items still unadjusted," reported H. B. Campbell, chairman of Lockheed's negotiating committee. Lockheed workers are represented by IAM Lodge 737. Negotiations have been underway since Nov. 2.

Lockheed's aircraft division may be the last to accept the new contract. The company has been unable to come to terms with the U.S. Defense Department regarding the cost of the F-104 light fighter.

Now comes the question as to what the next contract will be. The Post Office Department is a professioning conference between a Civil Aeronautics Board committee and the Lockheed Air Service, Inc., conference committee.

"It is hardly likely, in my view, that the Air Force would decide to make a speed record attempt with any airplane until it has progressed further in its flight test progress than the F-104 has at this point."

Chicago Copter Line Gets Weak PO Support

Helicopter transportation of coal in the Chicago area received a mixed endorsement in a statement filed by the Post Office Department at a professioning conference between a Civil Aeronautics Board committee and the Helicopter Air Service, Inc., conference committee.

The Post Office is satisfied with the Chicago operation but is unsatisfied in pushing the service. A Post Office representative said the Helicopter Airline had demonstrated the practicability of transporting coal by capacity and had performed a satisfactory job.

But "the benefits of helicopter service to the Chicago area are marginal in view of the network of truck routes that have been established," the department reported. "Nevertheless, the Post Office . . . believes there are substantial possibilities for this type of air transportation."

U.S. CAB officials to whom the heli-copter carrier's certificate, the Post Office will continue to act the air-mail service.

Army Reports Nike Can Hit Jet Aircraft

Ange Nike missile can hit jet planes but does not use them for targets because of high cost, according to Maj. Gen. James M. Curran, assistant chief of staff, G-3, armament.

"The Nike is effective against any type of aircraft including jet aircraft that have been found from the other services," Curran said. "Because of the high cost entailed in destruction of great numbers of modern high-speed aircraft, however, the Army has concentrated its efforts on high-speed, high altitude interceptors and has not yet tried to use the Nike against them."

"In the first place, the Nike is not an interceptor for use of the surface-to-air missiles," he said. "It is an antiaircraft weapon designed for use of the surface-to-air missiles."

Because of the salient problem is the high percentage of higher and traffic now carried by competitive transport, Curran said. The decision to make the change was made by the customer because the service provided by the competitor was better, he added.

New Buyers' Guide

Air Force Procurement Institute, consolidating all publications governing USAF buying and selling, has been issued a new buyers' guide.

The new Air Force publication contains detailed instructions for carrying out the basic policies of the armed services procurement regulations, the top guide for all military procurement

and acquisition procedures.

Curran's report is the Army's second "a comprehensive and useful version of the Honest John System" buyer's guide.

It aid all Army weapons systems alike for growth and modification to allow for new scientific advances.



New Lockheed 'Shoots' With Cameras

First flight view of the new Lockheed T-33 single-seat, photo-sensor version of T-33 two-place jet trainer, shown modified here having a battery of shooting and mapping cameras that "shoot" through trans-

parent panels in sides and bottom. Pilot has a tape recorder for detecting picture failure. T-33 is in production for delivery through the U.S. Air Force to Mutual Defense Assistance Fund countries.



AIRCRAFT TURBINE FACILITIES will be consolidated under new plan at the government-owned Westinghouse plant at Kansas City.

Westinghouse Puts Millions in Jet Program

By Robert Hertz

Kansas City-Westinghouse Electric Corp has reached a two-level merger agreement to expand and improve its Aircraft Gas Turbine Division. It will invest \$39.5 million in corporate funds to begin the new program.

The new Westinghouse jet program involves:

- Construction of a \$12.5-million research and development laboratory adjacent to the government-owned plant now occupied by the division south of Kansas City. This laboratory will be financed by Westinghouse. Sundstrand & Porter of New York has been awarded the architectural and engineering contract for the facility.
- Investment of \$7 million in Westinghouse's jet engine plant in Kansas to produce new designs for military and civil markets.
- Establishment of a jet engine flight test center at the Olathe, Kan., Naval Air Station.
- Augmentation of management, engineering and production staffs. The new management team is headed by W. Ward Smith, general manager, who joined Westinghouse from Standard Oil Corp. He succeeds

John D. Stoy, who is leaving that department with his own company.

"Westinghouse has every intention of staying in the jet engine business," Stoy says. "As a matter of fact, with the consolidation of our activities at Kansas City plus the addition of new, adequate laboratory facilities now under way, Westinghouse will be in a better position to do the development and production work necessary to ensure our position as a major participant in that aircraft business."

Battening these problems, Westinghouse management decided not to withdraw from the aircraft propulsion field but to concentrate, expand and improve its effort in an attempt to regain its earlier position as a leader in the business. The entire gas turbine effort soon will be concentrated at the Kansas City area—with research, development, engineering and production of wind tunnel and flight test facilities there.

In addition, Westinghouse is starting an expanded power development program on the 4,000-RPM jet engines now being developed at the 3,000-RPM thrust level. Work is progressing on a jet engine development program aimed at producing new designs for military and civil markets.

• Construction of a jet engine flight test center at the Olathe, Kan., Naval Air Station.

• Augmentation of management, engineering and production staffs. The new management team is headed by W. Ward Smith, general manager, who joined Westinghouse from Standard Oil Corp. He succeeds

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• Consolidation of all the facilities of all the division's functions at the Kansas City plant. Development laboratories occupied by the division at South Philadelphia will be absorbed in expansion of the Westinghouse Steam Turbine Division there.

Gordon Price, Westinghouse president, emphasizes that the corporation is as the aircraft propulsion busi-

ness to stay and move on, looking that development with its own money.

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The corporation also has begun to lay an initial research and development foundation on which to build in the two sales and production efforts. It is pumping corporation funds into what has been virtually a Navy-financed program to speed both the provision of adequate development facilities and the financial private development of new engines.

► **High-Power Test.** The new \$12.5-million laboratory will occupy about 230,000 sq ft and be equipped to do high-power testing on compressor, turbines, afterburners and fuel injection. Construction will begin early in 1959. Westinghouse will have a high-power compressor test facility and a phenomex anemometry laboratory.

Facilities for complete engine testing at all levels of conditions already are available in the plant's test cell and Westinghouse does not plan any additional test chamber in the new development facilities at this time, although they may be added later.

► **Rolls-Royce Facilities.** Flight test facilities to be established shortly at Gladstone will support a North American B-57 midrange bomber, regid to new test engines in a bombing pod, two Chance-Vought F7U Cutlass and a Douglas A-4 Skyhawk. A large new experimental aircraft shop now is being built at the Kansas City plant for development work.

In addition, Westinghouse can use the experimental aircraft shop, development laboratories and flight test facilities of Rolls-Royce in England to augment its own efforts. Westinghouse has established a liaison office there for engineers working with Rolls and in a rotating engineering personnel on an three-to-six-month tour, with an average of nine in the Rolls plants at all times.

The British company is doing component checks, test fixture design and other experimental work as Westinghouse develops. Rolls also is in the process of finalizing a contract to finance Westinghouse development facilities in South Philadelphia and Kansas City. The current Rolls-Westinghouse

agreement, signed in 1953, is for eight years with options for renewal.

► **Development.** Phenomenex-Westinghouse engine development philosophy is based on two major conclusions:

- Future engines will be an optimum size aircraft engines rather than simply the largest power output. Westinghouse engineers are planning to work at the 1,000-3,000 lb thrust range, using an optimum combination of weight/power ratios, low frontal area and low specific ratio rather than shooting for the highest possible power output.
- Future engines will be so efficient that the cost of aircraft will be reduced.

► **Future Engines.** Westinghouse is moving its thrust toward increased complexity in aircraft engines and making them more simple to operate and maintain.

Westinghouse engineers believe the past development of jet engines and their controls make it extremely difficult and costly to produce large engines fast enough to meet military combat requirements. They are devoting a major effort to simplifying designs to enable engines easier to manufacture in quantity and to increase their operational reliability in the field.

► **Stability.** Peter J. Williams—General manager Ward Smith told Aviation Week the division plans to work at the front edge of aircraft performance and that its future development will not be restricted to jet fighter types.

The division does not now have any active interest in developing aircraft nuclear propulsions, but Westinghouse has been a pioneer in developing nuclear power for ships and civil use. It is likely that the Aircraft Gas Turbine Division is not involved in the nuclear possibilities for plane propulsion.

► **Dart Market.** While the own development program is launching, Westinghouse has the U.S. sales and manufacturing rights for the Rolls-Royce Avon engine except for the market in Brazil and some selected countries.

Thus if Rolls sells its U.K. 109 turboprop to Douglas Aircraft Co for the DC-7D [Aviation Week Oct. 25, p. 13] and its competitor

prospects, Westinghouse will handle the project. But it will not have anything to do with Capital Airlines' purchase of Rolls Dart technology as part of the Vickers Vantage program.

There is strong American interest in the Rolls Royce, Lockheed Avro Corp. and Fairchild Engine & Airplane Corp. are interested in the 1,700-lb thrust engine. That for certain uses is another possibility.

► **Sales Sales.** The Aircraft Gas Turbine Division already has handled the role of the Rolls 1,500-lb-Dart. Now is USAF. For maximum input division, if required will handle modification of the engine to American standards at Kansas City. Since there is no U.S. engine in this thrust class, there may be a wide market for the Dart in that country.

Westinghouse is aiding in the American sales market for Rolls engines by the joint British sales team headed by Donald H. Evans, managing director of the British firm, and J. D. Preston, managing director of Avco Engines Division.

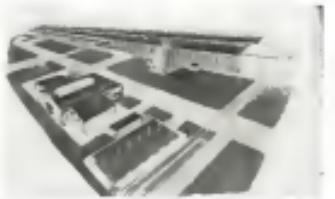
There also is more American interest in the Rolls Centaur bypass aircraft jet and civil and military jet transports. Westinghouse is pursuing the bypass design in its own development program.

► **Success Planning.** Although building Rolls jet engines under license for America one rule holds: Westinghouse through a check period in its production facilities, just as did earlier for Pratt & Whitney Aircraft. Ward Smith emphasizes that his division is breaking its future as an in-house development program and the new engine is produced.

There is no doubt that Westinghouse determined to make the effort required to get back into the thick of the jet engine business. But it will be at least five years before the success of that effort can be accurately mapped.



HIGH-POWER aircraft engine lab shown in details with



LOW-POWER test facilities, also to be built at Kansas City.

Lufthansa Expects Fast Comeback

But some observers say West German airline cannot overcome 10-year advantage held by its competitors.

Frankfurt—Officials of West Germany's Lufthansa predict the airline will make a rapid comeback after it resumes service April 1, despite doubts of some observers that the reviving international air carrier can overcome the 10-year edge held by its competitors.

The Kurt Weigel, chairman of the Lufthansa board—a post he held before West Germany's 1949 birth—believes Germany lies at the center of Europe, so he has expressed great confidence in obtaining adequate freedom of the seas. But the air is free and, in general, Lufthansa's routes, it is believed, only to obtain improved landing rights in the areas used by traffic and trade.

"This has not been difficult because the number of many nations now are flying to Germany, and they must give us reciprocal rights."

U.S.-British Fight—Meanwhile, competition between British and U.S. plane builders to fill the airline market apparently has become fierce, respectively.

Lufthansa recently took delivery on its first Convair 994 (AVIATION Week Nov. 29, p. 78) and last in addition three of the San Diego-built transports on Dec. 10. The carrier also has ordered four Super Constellations from Lockheed Aircraft.

The British are trying to convince the Germans that the American aircraft are obsolete. If Lufthansa expects to compete in Europe, the British argue, it must under English takeoff-boost aircraft.

West German officials appeared very concerned over the report during interview with AVIATION WEEK.

Lufthansa hopes eventually to increase 65 feet to a maximum of 80 miles each in the market for which British and American manufacturers are competing as a notable one.

Turboprop Interest—Despite British charges of discrimination, Lufthansa officials say they desire to convert most Lockheed aircraft because of their long record of efficient airline service. Speed of delivery was another consideration.

It is likely that the new Lockheed L-1049 turboprop Super Constellation (AVIATION Week Dec. 5, p. 77) will attract strong German interest if its planned introduction is successful.

The airline will use its beta-engine Convair for European flights to London, Paris, Zurich and Madrid, placing its Super Constellations into daily service between Hamburg and New York.

The airline hopes within three years to expand its operations to Africa, Asia and South America.

Lufthansa is constructing a large

passenger base at Hamburg, following a quoted battle between several German cities for the manufacturing center. An initial option within Germany will serve Hamburg, Dusseldorf, Wiesbaden, Frankfurt and Munich. When arrived both Cologne and Bonn

Commemorative—Carbo-Sauer agreement by the occupying powers provides that only aircraft of Britain, France, Russia and the U.S. may use the air corridors to Berlin. Lufthansa will not be able to fly into that city—at least for now.

"In the ultimate analysis there cannot be question whether, under the Civil Aviation Act of 1938, the government has the authority to withhold the specific notice of the questions which are to be decided in court proceedings before the Civil Aeronautics Board to the end that they may decide whether or not they will become parties, what evidence they will introduce and how they will conduct themselves in other respects."

The East Germans are, using Russian-built aircraft, is operating between East Berlin, Warsaw and Budapest. It is expected to extend its operations to Prague, Moscow and perhaps such cities in Stockholm.

The Reds have refused to permit Scandinavian Airlines System or KLM Royal Dutch Airlines to operate into East Berlin, but the two Scandinavian-controlled Schlesfeld terminals. Their attitude toward Lufthansa undoubtedly will be even sterner.

Netherlands Center—Hub of the new Lufthansa network, will be Rhine Main Airport in this city, already the center for foreign airlines operating into Germany. Transavia here and at Hamburg, the nation's concession rental, are modern and efficient.

Once Lufthansa begins operations, probably by April 1, SAS, KLM and Air France will abandon their domestic routes within West Germany. SAS, for example, has been operating a 10-passenger DC-3 flying from German cities.—WJC

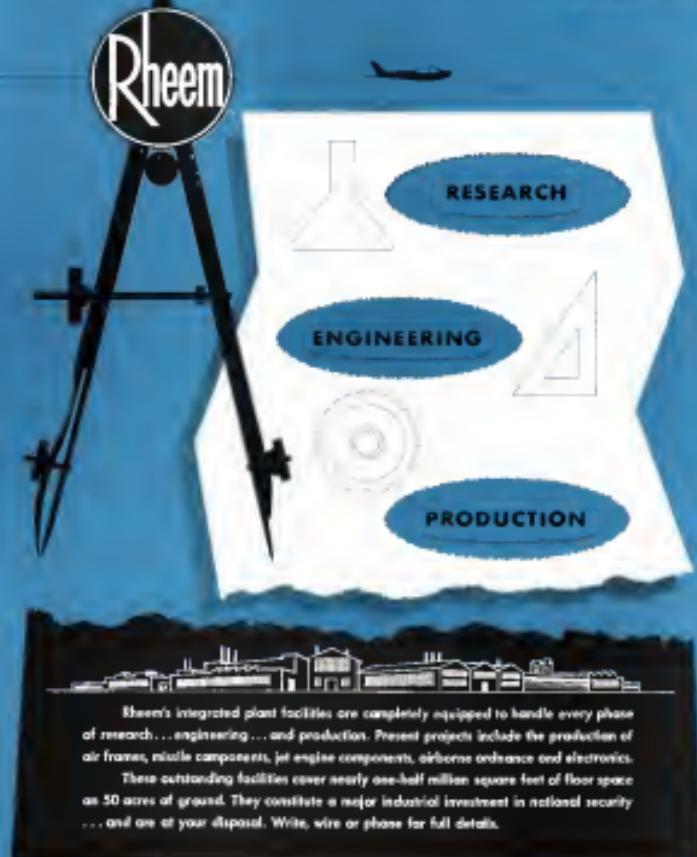
Dallas Gains Support In Airport Dispute

The Dallas-Ft. Worth airport dispute (AVIATION Week Nov. 29, p. 37) looks another turn as Dallas gained some qualified support from the Airport Operators Council in its Supreme Court fight with City Commissioners Board.

Dallas has asked the Supreme Court to review its case against the Dallas-Ft. Worth Central Airlines' move to Dallas Ft. Worth. In the Central appeal, presenting the Board granted the airline a route sale Dallas and Ft. Worth had specified that both cities be served

Contract for design of a new test cell at Arnold Engineering Development Center, Tullahoma, Tenn., to determine what happens when high explosive shells are fired into aircraft at high altitude and high speed has been awarded to McCloskey, Hallinan & Associates, Inc., New York, N.Y. Av Research and Development Command is increasing the project early this month (AVIATION WEEK Dec. 6, p. 21), used in simulating the damage.

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RHEEM Manufacturing Company... Government Products Division, Downey, California



SAS Sees Swing to Polar Flight

Airline reports early over-the-pole service is below break-even, but expects increase during tourist season.

By William Coughlin

Copenhagen-Sweden Airlines System has concluded its polar navigation techniques with the reliability of Douglas DC-8s to pioneer a continent or more across the top of the world that soon will be followed by other major airlines.

Early acceptance of the new twice-weekly nonstop flights has been good, SAS spokesman report, with load factor up to 80%. That, however, is under the break-even point for the 13-passenger DC-8E Royal Viking transports.

► **Northwest Passage**—Low load factors were expected during the first winter months of the new service and SAS is confident traffic will climb steadily with the approach of the tourist season. Travel agents already have reported a number of customers making bookings to the new over-the-pole route.

Begun with its first Los Angeles

to-Copenhagen flight on Nov. 18, 1972, SAS has carried its own "Northwest Passage" from the cold northern seas over the St. Lawrence, down across Hudson Bay and the cold north country of Canada to the Arctic. First British Europe and the U.S. were joined at Resolute Bay where they met together.

It makes Los Angeles a "gateway to Europe" and this Danish city a "gateway to California."

► **Direct Service**—Trans World Airlines and Pan American World Airways already have shown interest in the tantalizing return of the western Vikings. Routes in time and distance can be achieved in polar routes between Europe, the U.S. and Asia.

"SAS believes that the route across the Arctic for many reasons possesses great possibilities," says K. Hagenay Svartveit, vice president-operating. "People on the American west coast will get a direct service to Europe, just across wind-tripped ocean changes

in New York, and last but not least, the route has a great tourism value." ► **Final Flight**—U.S. previewers on the unstop flight from California to Denmark Nov. 15 were treated to the permanent polar flight and defense version with which SAS hopes to keep passengers from more conventional and less romantic routes.

The Royal Viking lifted from a foggy Los Angeles International Airport at 22 min. past midnight and arrived at Copenhagen's Kastrup 1 hr. 30 min. later in clear but cold weather. At the controls for the first leg of the transoceanic flight was Swedish Capt. Sven Giham.

Interior of the DC-8E used on the transpolar route have accommodations for 12 passengers and a crew of 10. There are eight berths available in the aft section and 24 forward "domestic" seats that may be lowered to full reclining position.

► **Polar Path**—Compared after a hard stop at Winnipeg, the DC-8 headed northeast for Blue West Eight (HW8), 2,000 mi. east on the west coast of Greenland, with Capt. Ferdinand Koch, 32, as Norwegian Royal Air Force pilot in command.

Flying at 17,000-ft with the outside temperature at -15°, the Royal



Swiss Test New Antiaircraft Missile

New version of the Oerlikon antiaircraft missile is shown during recent tests at Tschamut in the Swiss Alps. Delta wings replace the trapezoidal variant of the original layout (Aviation Week, Sept. 17, 1971, p. 31) and small reentry fins have been added near the tail. Loupian design has been cloned up. Manufacturer of the missile, Oerlikon Machine Tool Works, Burtscheid & Co., of

Zurich, says the Swiss Army will have priority on production missiles, but that "any Western country" may buy units. A batch of 15 has been tested at the United States at the Ballistic Air Development Center of the Air Research and Development Command, USAF. Guidance of the earlier model was inaccurate with a reported range of about 12 mi. No other details are available.

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Design and Production at El Segundo, California
and New York, New York

Viking dived north over Hudson Bay
and crossed the Arctic Circle at 2:55
pm EST.

Here, approaching the North Pole
area, the crew of the aircraft began to
sail on its Polar Path companion, developed
by the Elgin-Fairchild Division of
Bendix Aviation Corp., and open a new
navigation system and chart.

Navigating in the Arctic is plagued
by two problems:

- Convergence of lines of longitude at
the Pole. This was solved with a so-called grid navigation system in which
the navigator calculates all courses from
a single longitude, the Greenwich
meridian.

- Magnetic compass error at the vicinity
of the North Pole. This problem
was less serious. To solve it, Bendix
developed the Polar Path companion, a gyro
compass whose readings drift a
few thousand degrees per hour and whose
precession due to rotation of the earth
is compensated for automatically by a
device within the compass itself.

► **Airborne Radar**—During the winter months, SAS crews can only rely on external
navigation, since ATC navigation will be
able to take them in the thin. During
the coming summer months of daylight in the Arctic, only the sun will be visible,
however. Then the Polar Path will
be even more important.

► **Aircraft Rate**, using longitude
navigation systems, such as Elgin or
Gyro, that supply a series of
gained stations for guidance, will be in
the future.

This unique flight landed at the
cold and noisy USAF base at 10°N, 8°
7 to 13 min. past departure from
Winnipeg. After another brief pause for refueling, the Royal Viking dashed
away from the Canadian base and set
out on the final leg—1,162 mi. to
Copenhagen.

Weather in the Arctic usually is much
better than that of the North Atlantic area.
A continuous high extends from
around Alaska to northern Greenland
throughout the year.

► **Polar Micro-Cel End Speaker**, commanding officer at PWK, says the base has "some of the best flying weather
in the world." It is below 20° latitude
only 25% of the time, he reports. Nevertheless, the Air Force has one of its
best GCA teams stationed at Sondre
Strömstad and SAS crews are experienced
in GCA landings.

No account of the SAS flight would
be complete without a comment on the
men.

A typical crew includes Boston
crème and grape juice, cream of wheat
cereal soup, meat, wood gravy, cheese
and crackers, dessert and coffee. The
men are accompanied by specific
champagne, for white and red wine,
after-dinner liqueurs and brandies. These

Facts about **HELICOIL** inserts in the aircraft industry

What they are

Micro-Grip screw thread inserts are pre-constructed elements of stainless steel or phosphor bronze wire. Thread micro-grip holds like live permanent machine screws, strip-threaded screwing strength.

How they are used

These unique aluminum or magnesium
parts when fastened by Micro-Grip inserts
are much stronger, therefore you can cut
metal, rivet, shape and score the
repairs. You can also use them to repair
holes, shear severe in fastening wires through
flanges, bosses, thinner flanges,
and thinner wall sections.

What original components

Micro-Grip parts are used in propeller engines,
lighter fuselage, environmental, navigation,
communications in all assemblies. That
you find Micro-Grip parts in aircraft
engines, instruments and accessories,
down the heart of jet engines to skin
impressions.

For production salvage

When conventional tapped holes are fastened
to produce greater grip than the
part with Micro-Grip parts. Get
Micro-Grip parts to increase the
service life and reliable safety of
your aircraft.

For speed repairs

When stripped threads are located by wire
brushes, wire brushes, wire brushes, wire
brushes or location in ship or field with
Micro-Grip parts.

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When welding—allowing an accurate
machining or reworking operation.

For metal tips, use the coupon for free
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publish how-to-use tips on where others are
using Micro-Grip parts.

How they work

Holes are drilled and tapped, as you do
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can be used in any metal, wood or
plastic.

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and Industrial Uses



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yet CUT COSTS

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and other metals. Equally useful is wood and plastic.

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can use fewer or smaller fasteners. Because they roll cold, the
need for solid bushings you can use smaller bushes and bushings.

BIGGER PROOF

Look at these items—examples of the aircraft industry's growing
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► **McDonnell** has been the first user of Micro-Grip inserts
4 to 5 minutes on the 173 over the 145. In the forward frame
alone the number has climbed from approximately 50 to 100.

Pratt & Whitney pioneered the use of Micro-Grip inserts
in spark plug openings in reciprocating engines. Today
they are the largest user for this purpose.

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Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Haven Atles,
Senior Member, Aviation Writers Assn.

Recently there came in the mail a most gracious letter from a woman aircraft worker who asks about the "title cap" in the industry.

"As the operator of a drill press," she writes, "I only see the parts, hundreds of different kinds, and it's hard to visualize them being a part of the streak of speed that cuts across the sky ... Everyone, regardless of paycheck size, likes to feel that his efforts are appreciated..."

In writing about airplanes and flights, pilots and engineers, business problems and new developments, it's far too easy to forget the "title cap" as she calls them. Yet where would the industry be without them, these hundreds of thousands of workers whose myriad routine tasks evolve eventually into completed aircraft?

Just because they are known, however, doesn't mean their individual jobs do not require unusual training and talent skills. And don't make the mistake of thinking that because they are so highly skilled that they can be replaced easily from higher paid personnel or that just what they do is not vital to the vital nature of their work.

It's the job, and how it's done, which counts.

A drill press operator, for instance, has a basic role in aircraft production, but he is not the only one involved. Between the tool wielder, the tube bender, the rivet washer, the painter, the wire washer, the wrencher, the numberless machinists, operators, assembly line workers, and countless other crafts people who contribute their share toward perfection.

Of course there would seem to be little glamour in the great variety of jobs that keep the big planes flying and the small ones too—cleaning, welding, painting, etc. But the fact is that the industry is like a huge, healthy, dynamic organism, and once it is broken from rest and in the very beginning, you come up with a magnificently picturesqure picture of tremendous strength by means of men and women, made of flesh "title caps."

It's difficult, perhaps, for a practitioner worker to appreciate his part in the running industry. He may feel his job is dull and uninteresting, that he's just another cog in a vast machine, like the gears that push through his hands.

Yet he has only to look his way to find his work at the airplane plant will be complete. It makes no difference that someone else said it was the same job in

that avenue of S&S, while Deorsarki and Novacek each held two-somenothings.

Operation of the airline act not unusual. Each nation's participation consists of 30% government investment and 20% private capital. SAS is run by a board of directors made up of two representatives from each country, with the chairmanrotating yearly among the three nations.

It is an unusual demonstration of international cooperation, particularly when it is realized that national pride and competition among the three countries may be enough to that of, say, Czechoslovakia, Israel, France, etc.

• Olden Airline—SAS chose in December 1945—the oldest existing air transport company in the world. Founded Oct. 29, 1918, operating regular service between Copenhagen and Wiesbaden, 180 mi distant, with a Fokker-Schleicher biplane. Sweden's ABA began operations in 1924 and Norwegian DLN in 1927.

SAS runs its own maintenance base at Kastrup Airport here in Copenhagen. It has repair and maintenance contracts with a number of European nations and handles all aircraft repair and overhaul work for the NATO countries. SAS has built an aircraft plant just for U.S. Air Force DC-4s in Europe.

The company is already at work on plans for another polar route linking Scandinavia and Japan via Alaska.

Catalina Suspension Gets CAB Approval

Carolina Air Transport has obtained permission from the Civil Aeronautics Board to suspend service temporarily between South Catalina Island and the California mainland. In September, CAB denied Catalina authority to suspend service, but the air carrier started ground operations.

In applying for reconsideration of the earlier CAB decision, Catalina pointed out that it has no personnel or operating equipment with which to run the service and has been unable to make a deal with another carrier to provide it. • UAE Operation—Catalina hasn't operated the route since 1943. United Air Lines took over the route authority and, by Catalina's certificate as 1946, operated it under a contract that terminated Nov. 1, 1954.

When United's contract ran out, Catalina wanted a temporary suspension until spring, arguing it could not maintain service immediately without equipment or personnel. Yet the Board told Catalina to hold its start operating Nov. 1, but the subsequent decision given the carrier to suspend service until it was prepared to operate again, but not later than May 1, 1955.

Whatever causes the "title cap" that keeps the big wheels turning,



**when
is
an
airplane
great?**

- When its performance characteristics solve critical operational needs
- When its versatility permits a wide range of missions
- When its design potential is inherent in its basic design
- When it is a "pilot's airplane", naturally simple and easy to fly
- And finally when it's out of engineering and in the air—when it's being delivered and in operation

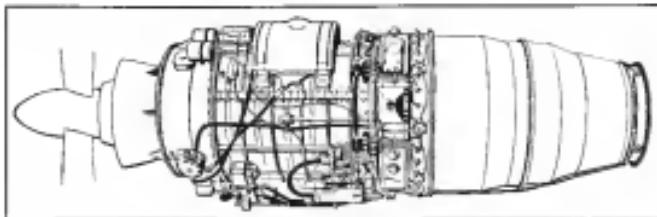
The Martin B-57—bulldog new member of the Air Force's family—it truly is a great airplane. Low wing loading gives it take off and high altitude performance characteristics exceptional in the reconnaissance bomber class, and the Martin rotary bomb door makes it capable of both high and low-level bombing runs at fighter speed.

These configuration changes now make possible adaptation of the USAF B-57 to cover a wide variety of critical missions.

But for the final word on this remarkably versatile airplane—ask the man who has flown one.

You will hear more about Martin!

MARTIN
BALTIMORE - MARYLAND



DERATED TURBOPROP based on Wright's 12,000-shp T49 (Aviation Week drawing above) would produce 6,000-6,600 shp

Wright Pushes 'Supercharged' Turboprop

Hurley says derating the military T49 would provide airlines with powerful constant-output engine at slight development cost and time.

By Irving Stone

The derated turboprop engine is advanced by Roy T. Hurley as the logical powerplant to speed development and operation of future propeller-powered commercial transports at this country.

Hurley, president and chairman of the board of Curtis-Wright Corp., told AVIATION WEEK that studies at the company's Wright Aeronautical division indicate the feasibility of using a

derated version of an existing high-power turboprop engine as planes such as future models of Lockheed Super Constellation and Douglas DC-7 aircraft.

► **Benefits of Derating**—The desired version of a high-power turboprop is thus offering these advantages:

- Constant power availability from sea level to operating altitude.
- Increased block speeds.
- Increased revenue 10 miles per year.
- Big savings in development costs usually involved in bringing an engine

from scratch to a status comparable to that of the derated existing turboprop.

► **Relatively Early Availability**—
• **Increased Reliability and Durability**—
• **T-49 Studies**—Wright's studies obviously refer to a derated model of the T-49, the military turboprop based on the company's J65 turboprop. More than 3,000 of the J65 have been built.

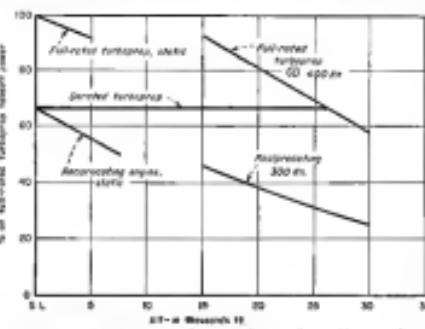
Aviation Week revealed the installation of the T-49 in Boeing's 320-47D, in collaboration with the General Electric J47, the plane's current powerplant (April 16, p. 14).

The maximum power of the military T-49 is approximately 18,000 shp. The desired version for commercial applications naturally would be in the band somewhere between 6,000-6,600 shp. From this derated value, the engine would have a growth potential up to its full rating, but that, of course, would mean some redesign or modification of the engine using the engine to take that additional power.

The derated version of the T-49 probably could be ready for delivery for airline use in 1958.

► **Constant Power Advantage**—Wright engineers point out the advantages in advancing the use of the derated turboprop for commercial transports.

With the conventional turboprop engine designed for a certain low power rating, it is necessary to derate the engine to have a takeoff rate off with altitude as a result of reduction in air density. It would be desirable to take off with a power value which reasonably could be maintained over a fairly wide altitude range.



POWER-ALTITUDE RELATIONSHIP indicates how derated turboprop, like a supercharged engine, would maintain takeoff power in high altitudes.

Starting with a high-power turboprop—military engine, for example—and derating it to obtain a constant power value results in a horsepower vs. altitude graph which is essentially similar to that obtained with native supercharged reciprocating engines in use today.

Thus, if a turboprop that is initially designed to deliver about 10,000 hp at takeoff, is actually rated so to provide only two-thirds of that power—6,600 hp—the air-handling capacity of the basic full-rated engine will permit the 6,600 hp to be maintained at an altitude which will allow complete utilization of the aircraft's speed capability at that height.

► **Supercharged Turboprop**—In effect, the result is a supercharged turboprop with more total output capacity than originally. Thus, it follows that a smaller, lighter gearbox may be used, elongating the engine's life expectancy other than as evidence to operate at near maximum efficiency.

It is estimated that the lighter gearbox plus the derated engine will save about 11% from the weight of the full-rated engine gearbox.

Another big advantage seen for the derated turboprop is on hot-day takeoff, a condition which naturally may be critical for the conventional turboprop or turbjet.

With the derated turboprop, the throttle could be advanced to obtain the rated horsepower, despite altitude temperature effects with the conventionally designed engine, assuming the derated full shaft less than the standard rating, but still more than one hot day.

► **British Activity**—The use of the derated or supercharged turboprop is not new. British engine designers have been working along these lines for some time.

Royal Aircraft Co Ltd's BE.25 (Aviation Week Oct. 25, p. 115) in effect a derated engine, with a large air handling capacity not normally needed until altitude is reached. Slated for the Bristol Britannia transport, the engine is expected to maintain about 3,000 shp to more than 20,000 ft of altitude.

Because the BE.25 is a "design from scratch" powerplant, it is likely that weight reductions will bring along with them a reduction in the normal high-power rating used for transport service. However, a derated engine could be refined to save weight, if conventional rules warranted that additional development expense.

Another British supercharged turboprop engine under development is a Rolls-Royce powerplant with 4,400 shp, rising maintainable to about 30,000 ft (Aviation Week, Dec. 6, p. 13).

► **Lower Heat Stress**—The high-power turboprop designed for transport service will have increased durability, brevity

and factor in engine reliability.

► **Prop Modification**—Still another dividend that propeller aircraft firms and nose level could be reaped. This would be accomplished through modification of blade form and tip speed.

This would indicate that ratings in excess of 100% of the design rating could be obtained through the use of the propeller efficiency set of the prop.

The propeller change is derived partly on the basis that, in the derated engine, it is not necessary to approach the ultimate efficiency set of the prop.

The popular for Wright's version of the derated turboprop already has been tested and is an test for that application.

The smaller, lighter gearbox for the engine now is in the design stage.

Hurley points out that if a new engine was designed today it would have the same general characteristics as the derated turboprop. In effect, this opens a new approach to engine design, one utilizing the existing transport other than as evidence to operate at near maximum efficiency.

► **Heavy Load**—The engine builder should be given power for areas proven by the aircraft builder. Now for the first time, there is an excess of power available—more than normally is needed. For this reason, a little less propeller ratio might be accepted for greater operating economy, lower engine operating temperatures, and lower noise levels and lower cost because of improved reliability and reduced payload capacity.

Hurley points out that there for Wright's derated turboprop study has been limited to the economics of a place much at one of the succeeding aircraft in the Super Constellation and DC-7 series using this engine and the resulting changes associated with the propeller.

Preferring to keep it brief, Hurley says, at a Word check in the neighborhood of about 400 shp, for an economic range of order of 10 hours. The place with the derated turboprop also would be suitable for transoceanic flights—the duration of 1,000-1,200 hr.

► **Altitude compensated**—at between 25,000 and 30,000 ft. The place where the shrapnel should also be suitable for transoceanic flights—the duration of 1,000-1,200 hr.

The engine exhaust life. This results because derating is accomplished by operating the engine at a lower horsepower—perhaps in the region of 5000 hp less than that of the full-rated engine.

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HURLEY

interests should be taken in measurable steps.

The derated turboprop, he says, could easily and efficiently be followed in using instances, with a minimum amount of risk to the operator or the way of in liability.

The engine may introduce about 200-300 lb excess weight per engine installed, but this would be offset by the higher speed and shorter flight times, thereby saving fuel. In addition to the speed advantage, there would be a major reduction in engine maintenance per year which means money made for the operator, he points out.

Modifications of the wing, or a new wing, would be necessary to take care of the higher power and effectiveness necessary for higher speeds.

A new nacelle would be required, but the diameter of the derated turboprop would be approximately as that required for the existing Wright Power Constellation powerplants, now in wide transport service.

► **Project Factor**—as engine reliability.

► **Prop Modification**—Still another dividend that propeller aircraft firms and nose level could be reaped. This would be accomplished through modification of blade form and tip speed.

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Engineers Get Key Jobs, Survey Says

The engineer is a leader in industry, active in commerce, often well educated in the classical arts, says Stevens Institute of Technology, as a result of a survey of that college's 3,300 living alumni.

A total of 67% of Stevens graduates are now in policy-making or decision-making posts in industry, the survey shows. Compared to the graduates who have been out of college for five years or more, this percentage drops to a total of 71%.



EDO means more than PRECISION WORKMANSHIP

EDO Means Design, Too. Water plays an ironic, witty role through any structure nor precisely built. That's why making airplane fuselages for 27 years has made precision manufacture of sheetmetal components a specialty at EDO.

Besides of sheet metal, sheet metal-working know-how, many manufacturers are turning their hand to make personal, subversive problems over to EDO.

What's more, EDO's versatile engineering staff, which has designed everything from complete aircraft to the Navy's latest major equipment can tackle problems right from the design stage, if desired.

Perhaps EDO can help you.

A FEW EXAMPLES OF
EDO CRAFTSMANSHIP



EDO
CORPORATION
COLLEGE POINT, NEW YORK
Since 1925

Stevens says its figures confirm other recent surveys which have shown an increasing number of engineers called in to fill top industry jobs.

► Other Jobs—About one-third of the graduates are working and doing well in fields outside their engineering, such as banking, finance, insurance, law, medicine, dentistry and the clergy. For example, this group includes 10% of the engineers who graduated shortly after graduation, they said, and 10% of them had to do over again. They would attend re-enrolling college. The approach they learned to analyze problems has proven useful in their chosen profession, they say.

A warning on the engineering shortage is it shifts. He never envisions such as aviation and aviation as constant in the survey.

Says the report, "New industries do not draw on the entire reservoir of engineering talent (over for supervisory purposes.)

"Indeed, they seem to depend largely on new graduates to staff their engineering departments. The limitations of the supply of experienced engineers, as the supply of new engineers below the demand for the years immediately ahead, will all odds force still further price equality."

"These odds to affect more are the new students, many of whom rely heavily on engineers to develop new products and processes to make use of recent scientific discoveries."

► Income—Cited—A year after graduation, 10% of Stevens graduates are earning more than \$5,000 annually after 15 years; 40% top the \$16,000 mark. At retirement age, 25% of them earn over \$28,000 annually.

About one-quarter of the group said they actively participated in music, drama, painting, sculpture or writing.

More than half the group said they take part in civic affairs, the Stevens survey reports.

Double-Shell Hull Called Noise Shield

A double-shelled hullage may be a design feature of future commercial air transports, say Douglas Aircraft Co engineers M. M. Miller and Raymond Block.

Major reason for the unusual design is noise reduction, the two Santa Monica division engineers told members of the Acoustical Society of America at the 48th annual meeting at the University of Texas.

► Executive Note—The Douglas duo claims that noise tolerance limits for the passenger will be exceeded if preventive steps are not taken in the structural design of the cabin. Available evidence indicates that there will be no significant reduction of noise at the present time.

Thus, the attack on the problem must center around the design for the moment, say the engineers.

Douglas had designs and patents on double-shell structures for the DC-3, but never used the idea because production costs, detail design difficulties and the extra weight added overrode the real need for the design at that time.

The engineers said that some solutions, bought for the lesson possible price in weight, presents an expensive and challenging problem for the air craft industry.

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Wherever You Fly—Enjoy
Top Engine Performance
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Red Horse Products!

If top-flight performance and protection make this famous pair your traveling companion. Not only do Flying Red Horse aviation products have the approval of every major aircraft builder... compare rigid specifications of the Army and Navy—but they can be found at hundreds of U.S. airports, coast to coast, border-to-border.

Take a trip! Always take off with the Flying Red Horse!

WHY ACCEPT ANYTHING LESS?

Based on independent research, Flying Red Horse products are the most reliable, longest lasting, and most economical aircraft lubricants in the world.



FIRST TWO STAGES of 3-stage missile now would be piled for recovery

New Light Cast on Space Flight

By David A. Anderson

The ninth annual convention of the American Rocket Society was held in its predecessor, the planned "High in con junction with the American Society of Mechanical Engineers, was larger and better and the quality of the presentations was uniformly high.

During the three-day (Nov. 30-Dec. 2) meeting in New York, 34 technical papers were presented. In comparison, they covered the field from aerospace design to a concert concert for a transatlantic satellite ferry vehicle.

Space flight attracted the most attention; two sessions were devoted to the subject.

Highlights from some of the many significant papers are presented in the following columns:

► A Preliminary Design Study of a

Three-Stage Satellite Ferry Rocket Vehicle with Piloted Recovery Stage

—By Derrill G. Russell, Research II Knight and John M. Van Pelt, Goodyear Aircraft Corp., Akron, Ohio

An unusual satellite system, in which the first two stages are piloted and can—after boosting the payload—glide to a landing in aerospace flight, appears to be the best answer for recovery of payloads between Earth and a remote low orbit.

Each separate vehicle has delta wings and a set of nose doors which close after jettisoning of the stages ahead of it. The apogee booster stage then becomes a glider and returns to a landing base, where air pods and other parts are installed for the flight back to the launching site.

In this, the longest and most complex paper at the ARS sessions, the authors do not recommend that such begin immediately. They emphasize

that the present state of the art does not permit that to be done. This does not mean that modern design and technology provide no useful tools with regard to an overall program with space flight as a final objective.

Logistics and economics are crucial and for the system, the data indicate that the system is superior to other earlier ideas in these respects. There is operational flexibility for satellite emergencies, lack of which has been cited as other proposals.

The funding though is a long-range research and development program, initiated at the presentation, for starting with uncrewed vehicles and increased solar research aircraft and ending with the data necessary to begin the big task.

High-Altitude Launching of a Small Orbital Vehicle—Dr. Kurt Schildknecht, Bell Aircraft Corp., Buffalo, N. Y., and R. M. Mason, University of Texas, Austin, Texas

A large plastic balloon is proposed as a carrier for the launching of a three-stage satellite vehicle carrying a 10-lb payload.

The importance of the Reaction Launching-Skyhook balloons and Decelerators—out the variables to feed in a system that can support a system for placing a man-made object in a satellite orbit. The hot air being used for launching reaches a plateau at 75,000 ft.

A three-stage vehicle could be built for an estimated 13,500 lb., and would withstand the pressure in an orbit at altitudes up to between 100 and 300 mi.

Instrumentation for Space Vehicles—Dr. George W. Housner, Office of Naval Research, Washington, D. C.

The greatest difficulties in controlling precisely with the stability of an uncrewed earth satellite. Useful or not, I am sure of one thing—if we get an uncrewed satellite, someone will soon decide to eat a hole in it, call it a cockpit, and stick a man in it. My main interest is to see that it is a cockpit that will be designed to maintain the characteristics of the man before it is built, not afterwards.

With that prospective remark, Housner led off with a discussion of some of the problems of manized space flight instrumentation.

"Typical of the attitude problem," he said, "is that it be free thousands of feet above the new destination." There are three factors to consider: How will attitude be maintained, how will it be reduced and what impact is there?"

"I hope that some of you will start thinking about these problems now instead of waiting until recently required stages of acceleration."

Hydraulic Logistics—Don W. Ryker,

Here's something to shoot at



The Air Force is faced with an important need: a winged target which will simulate jet fighter evasion maneuvers—provide realistic aerial gunnery training for pilots flying at near hypersonic speeds.

Goodyear Aircraft, working closely with the Wright Air Development Center, has designed and built such a target: the 14,000-pound all-metal target shown here, which combines the desired features of realism and reusability.

It can be drawn at high altitudes at speeds in excess of 500 m.p.h., offset to one side of, and as far as 2 miles behind, the tow ship.

It can be made to perform evasive maneuvers either automatically or by direct control from the tow plane.

It is equipped with landing skids and a cable-release device which permits repeated use until the target is "all shot."

It is an interesting example of the cooperation, design abilities and production skills which have made Goodyear Aircraft Corporation "The Team To Team With in Aeronautics."

Goodyear Aircraft Corporation
Plants in Akron, Ohio and
Litchfield Park, Arizona

GOOD YEAR AIRCRAFT

THE TEAM TO TEAM WITH IN AERONAUTICS

New kind of fuel level switch

Honeywell
develops new
way for tiny
thermistors



Now the thermostat, mounted directly on vacuum tubes, can't share the spotlight with another component—the diaphragm.

The thermostat is a rugged, inert, two-wire resistor whose resistance changes precisely at the temperature change.

Honeywell has put it to work in a new kind of fuel level switch.

The Honeywell ThermoLevel Level Switch has many uses. On the B-47, it serves as a high level switch to prevent fuel spillage. Whether it's in the air or on the ground, overflows are wanted and extremely hazardous.

It can be an air and low-level switch to automatically sequence fuel in center of gravity control operations.

Quick facts about Honeywell's new ThermoLevel Level Switch



Complete Level Switch,
including probe, diaphragm,
thermistor, resistor,
relay, bridge.



Small sensor can
be used for narrow
fuel tanks. Bridge
and resistor are external.

- Power source—18 Vdc or 121 V, 500 cps
- Available in a variety of models
- Available on easily customized for a specific application

- Requires no vacuum tubes
- Requires no adjustment or fine tuning
- Will meet requirements of applicable military specifications

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2600 Ridgedale Road, Minneapolis 13, Minn.

Methane Corp., Baltimore, Md.
Hydrogen, a rocket fuel candidate either as a monopropellant or in combination with an oxidizer, is now available in large quantities.

Until recently this valuable new chemical was limited to a small market as a high-purity research item. Rocket scientists thought it would be a valuable addition to the program if it didn't cost so much, and the manufacturer thought it could be produced for less if there was a big sales potential. Neither side made a move for a long time.

Now Methane has brought into production a commercial plant at Lake Charles, La., because of hydrogen's value to the rocket program and because of the commercial possibilities of the chemical.

Raw material position is good, thus appears to be a lower future price level of about \$1.50/lb per pound. It is shipped in 51-gal drums.

Hydrogen Components Components consider the researcher as a "conservative buyer." Operators using the material should wear protective clothing, should flush the skin with water if there is any contact with hydrogen, and should remove and wash any clothing on which the material is spilled.

► Methods for Environmental Testing Rocket Engines

By Loren Miller and Eric Hirsch, Reaction Motors, Inc., Kokomo, N. J.

What are the economics and methods available for simulating the various environmental test conditions for the performance of rocket propellants? The engine designer needs to know how to simulate the following temperatures: -193°F and +230°F, altitude to 100,000 ft, and humidity to 100% at the metal stage to study.

Liquid propellants require a conditioning tank specially designed, but solid propellants can be tested either in place, by using a clamp hot and cold chamber, or by using a combustion unit.

Components for propellants are separated into two groups. The conventional environmental chamber will handle one group, but the other—because of hazard or complexity—must be handled in special equipment, perhaps expendable.

Rocket engines can be handled in the same way as components, but RMI operates along the line that expendable chambers used in conjunction with a propellant conditioner and a static combustion chamber is the most practical approach.

► Supersonic Component Test Modes
By Donald L. Averill, Es-Cel Industries, Inc., and Harry Wurst, Cook Research Laboratories, Chicago.

Sliding and Gliding are two modes developed to test system static,



FLEXBELT VALVES

FOR FAST REMOTE CONTROL OF FUEL, WATER, OIL, OR AIR

The Flexbelt Valve is designed for fast remote control of flow media on high-speed aircraft. It handles large flows and controls high pressures over a wide range with low power requirements.

Pressure of the flow medium holds the Flexbelt Valve member (Viton®-impregnated glass fiber) tightly against the outlet opening, thus sealing off flow completely when the valve is closed. Flow is controlled by rolling the Flexbelt onto a concentric notched drum thus peeling the belt away from the inside surface of a cylindrical seat. The valve seat, Flexbelt, and valve shaft share a subassembly permitting change in the valve flow characteristics by repositioning as a unit.

Specific applications of the Flexbelt Valve include remote fuel flow control in aircraft fuel systems and control of maximum exhaust gas temperature by variation of fuel flow to a turbojet engine.

We believe our long experience, extensive facilities for developing, manufacturing and testing control system components for high-speed aircraft can be helpful to you. Our engineering counsel is at your service. We welcome your inquiry.

SPECIFICATIONS— Flexbelt Valve Type 1474

FLOW MODE:	More than 1000 lbs/min., 40, 45, and 60 psi.
FLOW RATES:	Up to 20 gpm at 125 psi pressure drop.
FLOW CHARACTERISTICS:	Linear, nozzling, laminar flow, EPIC.
OPERATING PRESSURE:	Up to 1000 psi maximum.
OPERATING SPEED:	2 seconds from full open to full close.
VALVE WEIGHT:	110 lb in 60 sec.
VALVE SIZE:	1/2 in. NPT female.
VALVE MATERIAL:	Viton®-impregnated glass fiber.
SEAT MATERIAL:	Stainless steel.
SEAT DESIGN:	Concentric notched drum.
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pendulum and other components of high speed in free fall.

Under normal conditions, the engine must be there to test velocity, no concern for a high-speed design; after test equipment has functioned, the high drag adds the recovery of the missile for reuse because it slows the vehicle down.

Shuttle 1 was an unpowered vehicle intended to test pendulums at high reentry speed in free fall, a dynamic pressure of 400 psf had to be simulated at 20,000 ft altitude. Tests made with Shuttles 1 and 2 did not turn out as planned, and served as a prototype of a dangerous powered vehicle.

Shuttle 2 is powered with three

11,000-lb boost. Rate tests. At launch, it should reach about Mach 2. The design is still under development.

Cheswick, who originally designed the pendulum test, now uses a different test and designs pilot at speeds up to Mach 15 at 20,000 ft. Power comes from a solid-propellant rocket rated at 50,000 lb thrust for three seconds.

Two carts have been made; both were unsuccessful, and in both cases, the pendulums recovery did not work. But the desired test outcome test was completed satisfactorily.

► Rocket Simplification With Multi-Function Components By Bremse

Elgin, Rockford Motors, Inc., Rockford, Ill., N.J.

The rocket powerplant, originally coming out as one of the least expensive carts, has come out as the most expensive through the years from economic complexity. This complexity is inherent in the majority of applications and reduces system reliability.

RMI has a program for system simplification by using such factors as commonality, bulk storage, thermal properties.

- Eliminate all unnecessary functions.
- Simplify the hardware that is used to accomplish the remaining functions.
- Eliminate parallel independent functions in the pendulums.

Following the program gets a designer into the position of specifying relatively more complex hardware for which there is no readily available parts. In this field, there is a need for creative person skilled in such problems as those involving moving, starting, pressurization, expulsion, pumping and gas valving.

► Development of a Stabilization System for the Viking Rocket By N. E. Full, Jr., Glenn L. Martin Co., Baltimore, Md.

Three separate subsystems are required to solve stabilization problems of axial and non-axial trajectory of the NRL-Martin Viking research rocket.

Motor control is used along the line of thrust of the rocket engine. Acceleration and orientation can be obtained on two axes, but the system is not accurate in a third direction for control.

The seek-in system with deadbeat on the basis of frequency response techniques, but the third requires the use of extremely expensive and non-linear systems.

Maran says the basic approach was sound. But the first two things have shown the need for greater reliability, easier adjustment, and interchangeability, especially during the early phases of the program.

► Performance Analysis of Short-Kings High-Velocity Ballistic Rockets By W. O. Bergman and L. M. Miller, North American Rockwell Corp.

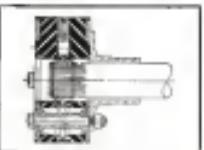
The short range ballistic rocket was originally designed to reduce maximum range of ground-to-air missiles. Now, however, the system's velocity between launcher and target is high, and these may be a short flight time.

The specific application plays a large part in determining the optimum configuration and the parameters which are normally important may not be important at all in the field of rocket.

It is possible to eliminate drag terms in calculating time-to-target and thus get non-optimum propulsion curves.

Lord Flexible Coupling
Flies With Kamran Helicopter

The Kamran K-5 helicopter presents an interesting application of the LORD J-525-2 flexible coupling with the Boeing 502-2 gas turbine. The function of the coupling in this case is to absorb the torsional vibrations of the system and reduce the torque from the motor. However, the belt also serves to accommodate angular or parallel misalignments due to manufacturing tolerances or dynamic motion.



The unique design of the coupling provides maximum accessibility and economical maintenance through the use of eccentric driving and driven shafts. The inner member of this pair is the engine shaft which turns the coupling hub through a splined connection. Pre-compressed against the collet hubs are the two bonded rubber coupling halves which transmit the engine torque in shear of the rubber. Four through-holes connect the outer plates of the coupling halves to the driven hub and also serve as the safety knockout in case the rubber section is destroyed. The first gear of the transmission is mounted on this driven hub and feeds power on through the system in to the helicopter motor.

For over thirty years the Lord organization has specialized in designing and producing Bonded Rubber Flexible Couplings, Vibration and Shock Control Mountings and Composite Parts. The expeditors of Lord Engineering have paved their way to designers of Industrial and automotive applications in many diversified fields as is illustrated in this instance.

(Advertisement)

ON LAND, SEA AND AIR
LORD Flexible Couplings
TRANSMIT THE FULL POWER
OF BOEING TURBINE ENGINES



HERE again you see at a glance Lord versatility in designing bonded-rubber components for a wide diversity of machines. The photo at top right shows the Boeing Gas Turbine-Diesel Truck-Trailer for heavy cargo hauling. At the top left you see a United States Navy personnel boat driven by the Boeing Gas Turbine Engine. Directly beneath is the Kamran Helicopter powered by the Boeing Gas Turbine Engine. Details are clear in the foreground. The Lord Bonded-Rubber Flexible Coupling designed for the job transmits the power in each machine.

Special requirements like these rank satisfactory and economical solutions at Lord, Headquarters for Vibration Control. We invite you to take advantage of more than a quarter century of design experience and craftsmanship.

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101 Clinton Building 1930 Broadway Street 160 S. Michigan Ave. H-1 House Building
PHILADELPHIA 7, PENNSYLVANIA NEW YORK 16, NEW YORK TEXAS BARTON L. ERICKSON
111 Whitehall Building 101 Franklin Street 401 Main Street Dallas 1, Texas 401 North Pearl Street
Rockefeller Center Safe Building

► LORD MANUFACTURING COMPANY • ERIE, PA.



Headquarters for
VIBRATION CONTROL

May God's bright star of Peace
shine upon our earth always.

The Holy Cross's Best Wishes From Oliver Oliver

OLIVER CORPORATION
AVIATION DIVISION
BATTLE CREEK, MICHIGAN

configurations even though the answers are not 100% accurate.

The specific application also affects the type of analysis to choose.

► Supreme Research Sheets and Track Facilities by F. W. Thorle, North American Aviation, Inc., Downey, Calif.

The use of rocket-propelled sleds sliding on rails at high speed has been a highly successful test procedure. Full scale test specimens can be "flown" through the transonic region to speeds as high as Mach 2.0.

Sleds, rockets, question and expanders can be used out of existing vehicles under controlled conditions in any direction with respect to the path.

This paper presents the types of sleds, projectiles and track facilities currently in use in the United States, and presents some of the general theory of tests and results from these tests.

► The Popo Radar Target—By Gilbert Moran, New Mexico College of Aeronautics, State College, N. M.

Popo is a radar reflecting high-altitude target for guided missiles, consisting of a parachute with a metallic silver coating and a rocket to raise it to altitude.

Momentary descent rate does not exceed 1,000 fpm, and maximum dash speed rarely exceeds 100 mph. This is a ready stationary target, and can be used as an addition to the target forces, rather than a substitution.

Lockheed to Award Scholarships to 15

For the third year, Lockheed Aircraft Corporation will award five-year college scholarships to 15 high school seniors who want to study engineering or a business discipline applicable to the aircraft or missile industry.

Fall tuition and fees plus \$350 for personal expenses will be paid by the company to students with "demonstrated financial need."

Ten of the grants are for engineering majors and the other five would apply to the study of business administration, accounting or industrial relations.

Scholarships are open to Missouri State Institute of Technology, California Institute of Technology, Cornell, Carnegie Institute of Technology, North Carolina State College, Rensselaer Polytechnic Institute, University of Michigan, Georgia Institute of Technology, Cornell University, Purdue University, Stanford University, Harvard University, Emory University, Parsons College, Northwestern University, and the University of Southern California.

Each participating college will get a \$500 grant from Lockheed to aid in administration of the scholarship.



REPUBLIC F-84 FIGHTER is backed up to engine exhaust and viewed by skirt when. Note Swift coupling landing skip sweep, vortex generator stay angle stabilizer only.



UPRIGHT EXIT of jet engine exhaust behind the propeller discoloration caused by exhaust. When afterburner is not used, conversion is possible right up to the propeller.

Jet Muffler Hushes Swift Tests

"Runaway success," is credited to a new exhaust muffler used by Vickers Armstrongs, Ltd., to both the use of jet lighting being run up on the greatest power to flight.

Conversion on the firm's South Road plant, however, was extremely difficult when the Swift's flight record was given full therapeutic.

When the new muffler was first tested on the aircraft, it rapidly exploded. Following removal of the new muffler and plane enclosure, nearly negative replies were received when inquiries were quizzed about some after the engine had been run normally. The next head, after the afterburner was used was not associated with such a trial.

Vickers Armstrongs is convinced that the noise level can be reduced further

On the New
Republic F-84F, Aeroquip
Self-Sealing Couplings

SPEED ENGINE CHANGE



Q-U-C-K engine change cuts servicing time and costs on the Republic F-84F Thunderstreak, newest, fastest member of a rugged family.

Aeroquip 2,000 psi J. Self-sealing Couplings, standard equipment on the F-84F, allow disconnecting of all hydraulics, pneumatic, fuel and oil lines in minutes, without dismantling. When the replacement engine is installed, lines are reconnected without interfering the fluid systems.

Complete engineering of aircraft plumbing systems is an Aeroquip specialty. Write for information.

Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN
AERO-COUPING CORPORATION, BURBANK, CALIFORNIA

Manufacturers of Aeroplite Flexible Hose Lines with Aeroplite, Aeroflex, Aeroflow, Self-Sealing Couplings, Bonded Blankets (Sheet EVA), Reproflex Ductless and Principal Office in U.S.A. and Canada; Aeroplite Products are Fully Protected by Patent in U.S.A. and Canada.

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For All Temperatures

Acoustical degassing of Fiberglas covered sprayed elastomeric seals offers a complete line of insulation and weatherstripping for aircraft, boats, trailers, industrial components and flexible sealing over other thermal areas. Elastomer seals withstand a 500°F. 15-minute temperature test and operating temperatures from -125° to +500°F. F-Flex™ Seal contains neoprene and flexibility to make it ideal for highly automated low compression seals with expanded neoprene and elastomer materials. Both Fyre-Tite and F-Flex seals are light weight, resilient or highly concentrated where used in engine seals.

Twenty seven basic material combinations in five standard shapes meet most weather requirements; custom made shapes and materials for special purpose.

Write for engineering data and information.



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PRODUCTION BRIEFING

► Audit of high priority materials to speed right jet B-57 bomber production is being undertaken by Boeing-Seattle in supplying second-source. Wichita plant will close schedule down task to master tools, production parts or engineering material when delivery dates would prove critical. C-97 Stratofighters are needed.

► One-end-flaunch Mighty Mouse rocket has been delivered to aerial lawn by Hayes Manufacturing Co., 2961 E. Colorado St., Pasadena 8, Calif. Mighty Mouse is 2.75 in. folding for aircraft rocket.

► New engine muffler bellows, for quieting jet range at Cedar's Mayne jet, have reduced sound vibration making nearby communities live approximately 15-30 decibels

► Lear, Inc., is expanding expansion of South Moines, Calif., Airport with two more buildings, providing a total of 69,000 sq ft floor space under one roof. At 20,000 sq ft, the structure will house heat treating, plating and other new equipment. A new 49,000-sq ft hangar and office building under way completion will augment Lear's aircraft engineering division facilities for producing Learstar business planes.

USAF Contracts

Following is a list of recent USAF contracts announced by AMC:

• Boeing Aircraft Corp., Wichita, contract # B-301, worth up to \$20.5 mil. net.

• Convair Aerospace Corp., San Pedro, Calif., contract # 1000, worth \$20.5 mil.

• Curtiss-Wright Aerospace Division, Lancaster, Calif., contract # 1000, worth \$20.5 mil.

• McDonnell Aircraft and Engine Corp., St. Louis, Mo., contract # 1000, worth \$20.5 mil. for aircraft engine overhauls, \$10.5 mil. for engine parts and ground handling equipment.

• Martin Marietta Corp., Mountain View, Calif., contract # 1000, worth \$20.5 mil. for aircraft engines.

• Lockheed Corp., Los Angeles, Calif., contract # 1000, worth \$20.5 mil.

• General Electric Co., W. Lynn, Mass., contract # 1000, worth \$20.5 mil. W. 1,000 mil. \$100 mil.

• Lockheed Corp. and Bausch & Lomb Inc., contract # 1000, worth \$20.5 mil.

• Republic Co., Ft. Worth, Tex., contract # 1000, worth \$20.5 mil.

• Sikorsky Aircraft Corp., Stratford, Conn., contract # 1000, worth \$20.5 mil.

• Boeing Co., Seattle, Wash., contract # 1000, worth \$20.5 mil.

• Pratt & Whitney Aircraft Co., Hartford, Conn., contract # 1000, worth \$20.5 mil.

• Republic Aviation Corp., Farmingdale, N.Y., contract # 1000, worth \$20.5 mil.

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AVIATION WEEK December 26, 1954



STATIC TEST RIG is hooked up in Toledo with its massive thrust. Pointer shows 10 lb.

How Hiller Tests Tiny Ramjet

An extensive development and test program lasting four years was necessary before Hiller Helicopters, Inc.'s little HRIBB ramjet might meet company and FAA specifications.

The engine has passed a 150-hr test run and is rated with an altitude rating of 10,000 ft. A propulsive duct is being built to fit the engine.

The HRIBB is a complete unit consisting of a diffuser, flashboard, combustion chamber and exit nozzle. Body is made up of shell segments fastened to thin sheet, welded to a heavier mounting plate forming the engine's enclosed reactor section.

The plate tapers in section and provides a flat central base to which the motor blade attachment tab is welded. Hub is formed by an inner liner forming a diffuser and the exit nozzle is formed by a thick collar welded to the shell segments. A thin, flame-retarding fragment disc holds the nozzle assembly in the exit section of the diffuser.

Performance data: Length 23.3 in., max. diameter 6.4 in., weight 12.7 lbs., 45 lb.-



HORNET COPTER tests sample shaft



RAMJET is mounted on Boeing activity



WHIRL TEST RIG has been used for well over 2,000 hr. of high-speed flight



Giannini high pressure transmitters measure accurate pressure variations and convert them into electrical signals of relatively high power and rapid rate re-amplification.



MODEL 48129

These high pressure transmitters measure accurate pressure variations and convert them into electrical signals of relatively high power and rapid rate re-amplification.

Transmitter from \$450 per set to \$1,000 per set. All available for operation under extreme conditions of temperature, humidity, vibration, shock, pressure, etc., and for use in aircraft, missiles, ships, tanks, etc.

Other models also available that have pressure and high voltage auxiliary functions and can be supplied with complete engineering information.



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PHENOMENAL GROWTH OF AVIONICS SEGMENT of aircraft industry (graph at left) excluding the corresponding growth of the auto industry itself, as noted by number of engineers employed by one large avionics manufacturer (right).

Aviation Week Survey Shows:

Airframe Avionics Is Fast-Growing Giant

By Philip Klass

In 1958, electronic-electricians engaged in aircraft plants were so rare that it was about as likely today, U.S. aircraft manufacturers alone employ more than 6,200 avionics engineers and the figure is up 11,000 to 19,999, as *Aviation Week* survey indicates.

In 15 years there has been a 3,100% increase in the number of avionics engineers on aircraft industry plants, the survey shows. Today, almost one out of every five engineers in an aircraft plant is engaged in avionics activities. These figures do not include an estimated 1,500-2,000 avionics engineers employed at Hughes Aircraft Co., which now employs itself as many, rather than aircraft manufacturers.

The individualized over the growth of the avionics industry during the past 15 years, the survey has been placed on record. For instance, while aircraft manufacturers had a 1,400% increase in avionics engineers still during the same period. During the next five years, the manufacturer anticipates a 15% increase in avionics staff, compared to an 80% increase expected within the air frame industry.

The *Aviation Week* survey also shows a sizable amount of avionics research and development within airframe companies, indicating a commitment to significant avionics improvements to all established aerospace manufacturers.

► **Why the Growth?**—This phenomenal growth reflects the greatly expanded role of avionics equipment in modern aircraft, and the ever larger role in the future aircraft field. Fifteen years ago only a handful of avionics

engineers were needed to fit out the simple electrical generator systems and plus the installation of the radio direction finder and communications equipment, yet about all the avionics equipment came on board.

Today, however, aircraft engineers and technicians are joined with avionic engineers—radio control, electronic countermeasures, navigation computers and sensors, electronic power and stability augmentation, in addition to communications equipment. Most of the equipment need be easily engineered into and integrated with the aircraft for optimum performance.

Control modules improve even more

Exclusive Report

For several years the aviation industry has watched with some apprehension the growing staff of avionics engineers employed by aircraft manufacturers and the increased activity of avionics companies in this field. Now, for the first time, *Aviation Week* is able to detail the growth and scope of this development, as shown by results of an industry study conducted by this magazine.

Surrounding article in this issue will discuss factors which appear to favor or encourage growth in the avionics industry, as well as examine factors which limit and restrain growth. This report is based on information which *Aviation Week's* Avionics Editor, Philip Klass, has held with both avionics and aircraft manufacturers.

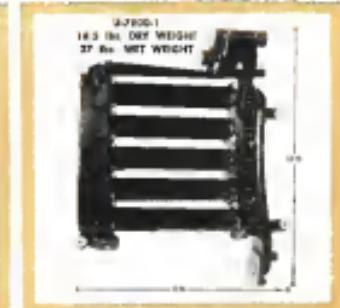
The significant measure of this potential threat to the established avionics industry is the number of avionics engineers engaged in avionics research and development. In this regard, aircraft manufacturers are experiencing developments by outside concern. These R&D entities will span the avionics, devices, and systems which may compete with the established avionics industry. In some instances the competition already exists.

► **R&D Activities**—The *Aviation Week* survey shows that the following percentage of avionics industry avionics engineers are engaged in R&D activities:

- 53% combined average full-time avionics engineers
- 15% of those engaged in guided missile work
- 27% of those engaged in piloted aircraft work
- Piloted-Aircraft Avionics—An indica-



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WHAT IS THE LEAR ARCON? Like to avoid the average plane's want to fly in a circle. With the Lear Arcon, your plane wants to fly straight—until you need it to turn, thus eliminating the deadly "graveyard spiral"—always a threat to the uninstrumented pilot.

IS THE ARCON AN AUTOPilot? No, but it is the next best thing to an autopilot, especially when you are under pressure to do something else, such as a go-around, communications, or just plain relax.

IS IT A SUBSTITUTE FOR AN INSTRUMENT RETROFIT? No more than a life-preserver is a substitute for knowing how to swim. However, the Arcon could save your life if you were inadvertently caught in "weather," and it will ease the burden of the qualified instrument pilot who deliberately chooses to fly instruments.

WHY LEAVE THE RUDER DEVICE ON ITS OWN? The Arcon is simple, foolproof, uncompromising in quality. Magnetic switches are used instead of fibers—"printed" circuits instead of wires. No trim lights to monitor.

Built to military standards of performance and dependability. Designed for trouble-free operation.

WHAT TYPE OF PLANE IS IT SUITABLE FOR? ALL TYPES. And equally easy to install in all.

IS IT CAA APPROVED? Every Arcon installation is CAA approved for each airplane type.

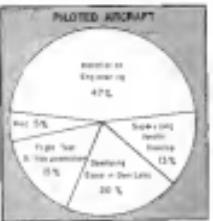
IS IT INDUSTRY APPROVED? The Arcon will soon be offered as flying control equipment by most leading aircraft manufacturers.

IS IT PILOT APPROVED? Ask any pilot who has had an opportunity to fly it. You will meet very few pilots who will fly without it, because it makes an airplane fly the way it should fly—automatically. The Arcon is here now. See it. Fly it. Discover how it "marks a new era of safety and utility" for you!

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ARCON means Automatic Rudder Control



THE CHARTS SHOW how defense industry (aircraft and missile) firms in, of all main electronic electronic engineers.

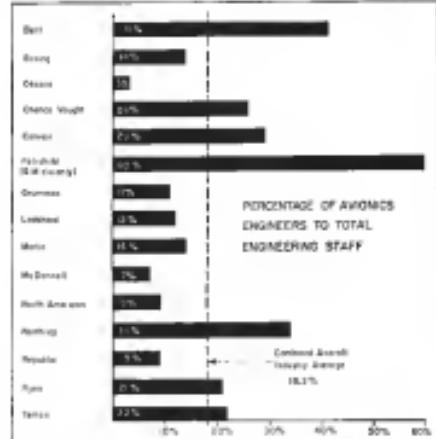
To wide breadth of avionics engineers' interests, however, those engaged in piloted-aircraft operations indicate that most are performing in-house R&D for their own companies, plus almost from the same sources in design. However, the last's share goes up markedly for guided missiles. The breakdown for pilot aircraft:

- 30% developing equipment in own labs
- 13% supporting outside vendor development
- 47% in flight test and evaluation
- 19% in flight test and evaluation

• 31% manufacturing.

Because some companies consider the use of their engineering staff properties information, Avionics World has concentrated on relevant data for individual companies. Thus, the results indicate that the following devote a substantial percentage of their total man-hours/effort to some or all of these R&D: McDonnell Douglas, Northrop, Rockwell, Bell, and Republic. Companies at the other extreme include McDonnell and Textron. ■

Breakdown for Missiles—A corresponding industry-wide breakdown for avionics engineers at major world



NEARLY 1 OUT OF 5 engineers employed by defense industry in avionics.

plants show significant differences. For instance, a much higher percentage of total effort is devoted to in-house development, usually less to verification engineering. That is, the same teams, often with commanding overall figures shown in parentheses for ease of comparison:

- 45% developing equipment in own labs (28%)
- 14% supporting outside vendor development (12%)
- 28% in verification engineering (40%)
- 19% in flight test and evaluation (19%)
- 2% maintenance (3%)

Companies which devote a higher than average amount of avionics staff services to outside in-house development include Convair San Diego, Fairchild's Canfield Missile Division, and T-38s, and, among others, Convair, Convair-Curtiss-Wright, and Ryan are below average on this score.

The lower percentage of effort for verification engineering reflects the fact that most sensor equipment is tailored to its specific needs during its development and that there are few, if any, standardized equipments furnished by the government or GFE (government furnished equipment).

The higher percentage of in-house R&D reflects the finding of some analysts that this approach permits better integration of avionics and inside, where the latter's performance can be optimized to fit specific changes. There are continuing arguments on both sides of the issue.

However, as production engineers range from small to massive (with their longer economic cycles), regular review manufacturers seeking to sustain their share of the available market profitably can be concerned over the high percentage of in-house sensor development in defense plants.

■ **Corporate Breakdown**—A combined defense industry breakdown of avionics engineers activities for both au-



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AUTOMATIC FLIGHT AT MACH 1 —AND BEYOND

Superior speeds are steadily reached at successive intervals like this at Muroc, California. An interesting point: Honeywell's new E-10 autopilot design flew years ago before supersonic craft had been developed—but already has chosen to fly out of the air force supersonic plane.



Components of the new E-10 Autopilot. (1) hydraulic servo motor, (2) variable resistor, (3) diode and switch resistor, (4) fuse arrestor, (5) amplifier and collector, (6) pilot's control panel, (7) auxiliary bus control. The 15-inch relay you see above indicates compressor rate



Executive flight team of the E-10 was made up initially both at Honeywell's Minneapolis flight test center and the company's own flight test department. Chairing this team is the shop here at Honeywell's manager of flight operations, R. J. Whamper.

New Honeywell E-10 Autopilot provides automatic flight from take-off to transonic speeds

AT MACH 1 [the speed of sound] and beyond no airplane needs additional stabilizers. At this speed an airplane that at all points is supposed to fly and maneuver—can stop making of performing complex maneuvers.

That's where an autopilot is well—on relieve the pilot of much of his flight duty so that he can perform his assigned mission. That's also why a truly advanced autopilot like the new Honeywell E-10 is required—an autopilot designed specifically for mach 1 flight.

But, you don't always fly that fast. The E-10 takes that into consideration, too.

New E-10 is self-starting

In order to roll off in a smooth (100 mph) the electrons and resistors must have considerable power to get a heavily loaded aircraft into the air. As you approach the sonic barrier only slight deflection of the control surfaces are required to perform normal maneuvers. Beyond mach 1 you again need more control movement to perform your maneuvers. The E-10 automatically compensates for this by using a constant change in the rate of roll.

The E-10 Autopilot is a new concept in high performance flight control because of its unique electronic system of control. Electronic features—such as holding the aircraft straight and level, or making simple turns.

What the new E-10 does

The E-10 (1) stabilizes the aircraft at all speeds, (2) maintains constant speed even in diving or climbing

maneuvers. With associated radar and navigation systems the E-10 (3) stores the mapping on an automatic interpretation memory, (4) guides the plane along a selected path or portion of an airway route, (5) performs landing approach automatically at any weather.

With the E-10, the aircraft's flight control is limited only to the maneuvering capability of the airplane. The throughout very automatic maneuver, the human pilot retains full command through his special feature called Control Stick Steering.

This means that even though the plane is flying on autopilot the human pilot can instantly override or simply adjust the autopilot through his conventional cockpit controls.

Controls for everything that flies

We believe our contribution to America's position in the jet race is two speed shells. The ability to design the increasingly complex control systems which today's aircraft require. And the ability to produce these systems at quantities—on a basis of interchangeability of components which is necessary for maximum reliability, minimum weight, low cost, and engine interchangeability, the stand, service, and American design.

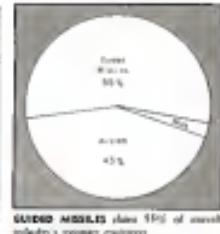
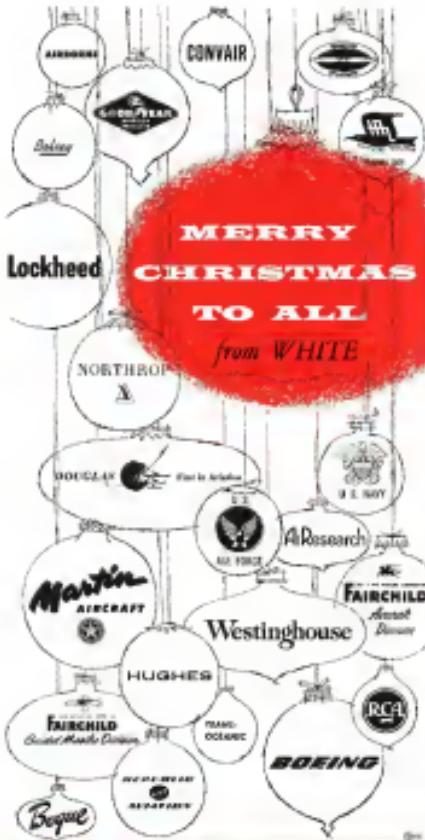
Besides the new E-10 Autopilot, Honeywell produces a complete line of gear for subsonic, transonic, supersonic, aircraft control, and missile guidance—other electronic equipment for helicopters and fixed-wing craft—measured fuel gauge, jet engine control, power controls, synchronous selector, actuators, amplifiers, valves and switches.

HONEYWELL

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2600 Ridgeway Road, Minneapolis 13, Minn.





GUIDED MISSILES claim 10% of aircraft industry's engineer crop.

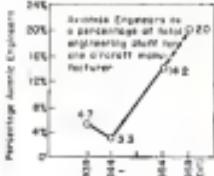
craft and missiles looks like this:

- 33% developing equipment for armament
- 14% supervising outside vendor delegations
- 13% in installation engineering
- 12% in instrumentation and flight test
- 10% metallurgists

• One out of five—North one out of every four engineers on defense contracts, 18.5% to be exact, is in avionics. AVIATION WEEK's survey shows 16 companies like Convair, Northrop, Bell and an unnamed Grumman division, that ratio runs 30, 40, and up to 60%, as shown in the graph on page 48.

The graph indicates which defense companies are most heavily concentrated to avionics, although percentages can be interpreted misleadingly and exact figures cannot be cited for competitive reasons. For instance, North American and Martin each have more than 100 avionics engineers, but their total engineering staff is so large as to dwarf the avionics staff and consequently small percentages figure.

• Paragonizing the Returns: In a few instances, service stations will be extrapolated to obtain overall industry-wide totals. For instance, Douglas Aircraft Co declined to give any information on the number of avionics engineers it employs. The reason, according to a company spokesman, is that "our composition has not yet made a distinction



AVIATION WEEK December 20, 1962



Cabin Comfort

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With Stratos, pressurization and air conditioning equipment aboard, the passenger is assured a comfortable trip regardless of flight altitude or outside weather. And the airline knows that it will have an air conditioning system.

Stratos cabin air purifiers have approved operating periods of up to 2000 hours. With the world's leading airlines they have clocked up outstanding service records—over 99% exceed their approved operating time limits in the summer months.

Stratos laboratory air cycle refrigeration units, in actual service tests, have operated 3000 hours without any servicing other than periodic lubrication checks.



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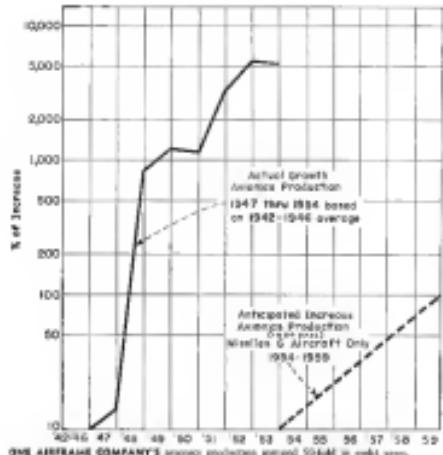
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tion between electronics and other types of equipment. For example, we have large electrical departments in all of our plants but they are as apt to be or perhaps even apt to be at work as powerplants than on radio, radar, computers, or other types of electronic equipment."

Rather than guess Douglas in the industry-wide totals, Aviation Week assumed that the ratio of its avionics staff to total engineering staff (which the company did provide) was at least one-half the average for the rest of the industry, or around 9%. On that basis, there are 150 avionics engineers working for Douglas.

Two companies declined to estimate the 1955 size of their avionics staff. Aviation Week therefore compared the estimated growth ratio (1947/1958) for all other companies, then applied the figure world wide. This gave an anticipated 1959 figure for those two companies.

Recognizing that the distinction between gradient engineers and field test engineers does not exist, we will without sheepskin, set off his family dress today, particularly in the aircraft industry. Aviation Week's survey questions referred to "electrical and electronic engineers (including physicists engaged in electrical work)" and did not specify "graduate engineers."

Aviation competition five years hence. In following article, Aviation Week will consider the prospects of this happening as well as some of the counter-acting factors which will act in a brake on such a movement, including steps which some aircraft manufacturers are now considering or taking.

Navy Ordnance Gets Highspeed Computer

A new super-speed electronic computer, with capabilities which make it attractive for solving complex aircraft, missile, and engine design problems, has been developed by International Business Machines Corp. for Navy's Bureau of Ordnance.

The new machine, called NORC (Navy Ordnance Research Computer), will soon be installed in the Naval Proving Grounds Computer Laboratory, Dahlgren, Va.

The new computer can add or subtract two 15-digit numbers in 15 microseconds, multiply two such numbers in 32 microseconds, IBM says. The machine operates with either automatic floating or specified decimal point.

Technical Details. NORC has a 16-digit word, decimal number system, and a three address automation. Automatic address modification permits the same set of instructions to perform successive sets of arithmetic operations on a series of data.

A high-speed electronic memory can store 7,000 words with an access time of eight microseconds. IBM says Up to eight magnetic tape units provide a larger storage capacity. Words with a read-out rate of 10,000 characters per second. This is more than five times faster than previous tape memory units.

Computer output is recorded on two high-speed printers which operate at 15,000 characters per minute. Case outer calculating speed is reduced 10% while printers are in operation, company reports. Case computer pulse rate is 1 megcycle.

New Microwave Test Equipment

An X-band radar test set, suitable for lab, production line, or field use, is one of several recently announced pieces of microwave test equipment.

The new radar test set can be used to measure power output, transmitter spectra distribution, frequency, and to supply artificial signals. Bandwidth characteristics can be analyzed and a self-excited square-wave generator used in making VSWR measurements. Unit operates from 50 to 1,200 cps. Unit power, weight 45 lb. Manufacturer is



Motion day aircraft require lighter, stronger structures to cope with the higher loads generated at speeds above Mach 1. The elimination of a single structural joint will often contribute a savings of many pounds in a highly loaded member. The result has been the trend to larger and more complex single structural fittings. Loud has made over 10,000 landing gear transmission fittings which is an excellent example of mass producing a tough job while maintaining a high degree of quality.

CASE HISTORIES

Today's airplanes are being built out of large forgings rather than fabricated sections. The spar fitting which qualifies landing gear transmission support and wing spar into one forged and machined fitting is representative of planes of concern. Although this fitting is over 6 feet long it is machined in Loud's 120 inch Cincinnati hydrotreat. Advanced design creates more complicated machining operations.

The maximum utilization of facilities is illustrated in the flash welding of a stainless steel. The change from the previous bolted joint design saved over 14 pounds per airplane in addition to saving considerable cost and providing a stronger fitting.

INTRODUCING TODAY'S AIRCRAFT REQUIREMENTS



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X-BAND TEST SET

Kearfott Co., Inc., Weston Model Dr., 14941 Owen St., Van Nuys, Calif.

Other new microwave test equipment includes:

- Pulse generator, Model PG-215, a microwave pulse synthesizer type, can produce pulses with rise and decay times down to 1.2 microseconds and at repetition rates of 20, or 220/sec. Amplitude of output pulse is variable from 0 to 50 millivolts with 95-decibel load. Unit also furnishes an isolated trigger signal. Manufacturer is Electronics Laboratory, Inc., Westbury, N.Y.

- Cloud seeder, Model 250, covers frequency range of 3.5 to 6.5 GHz by either transmission or absorption method. Unit can handle 0.5 milliliter to 1 watt by absorption method, 1 watt to 25 watts by transmission method. Approximate loaded Q is 2,500. Manufacturer: American Antenna Products, Inc., 166 Tappelfield Road, Westbury, Mass.

- Presaturation gunnister, Model 384 is a gunnister to generate or measure low-intensity electron beams. Beam spread is 1 second. Desired intensity is selected by means of six 25-position switches. A built-in 1-micron crystal diode modulator is used to measure beam intensity. Manufacturer: Foster Instrument Co., Inc., 135 College Mill Road, Great Neck, N.Y.

FILTER CENTER

- New look for B-58 Airframe—Because of critical problems of dissipating heat from the aircraft's engine, Convair's improved B-58, of aircraft equipment especially its large packages, is being packaged to prevent cold air exhausted from the cabin to be circulated through the engine before being exhausted in the atmosphere.

- In-Servo Corp. to Build Rotor—New Rotor, which enables an inflight control radar scope presentation and servocontrol voice to be simultaneously recorded on magnetic tape for future playback and analysis, will be manufactured and sold by In-Servo Corp. of America under contract to Spectrol Company recently

signed licensing agreement with Sikorsky, Kawasaki and Boeing, Inc., which developed the radio altitude system.

- Air Traffic VHF on Mexico—Air Transat has installed a VHF transponder atop Real Del Maestros about 8,000 feet altitude gives the station a 300-mile radius range, covering the area between the Gulf of Mexico and Mexico City over mountainous terrain. The mountain top station is fed into Mexico City by microwave link.

- Midget Radio Steerer—Lightweight gyro stabilized X band radio steerable which weighs only 15 lb. has been developed by Marconi's government division. Several aircraft manufacturers are reportedly eying the device for use in new aircraft.

—PK



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feet to
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With pressure from the pilot's feet, tons of metal are brought to a fully controlled safe stop. Planes are landing faster and better, but with continually imposed restrictions such as Gladden's jacks control units, greater power is needed and stop is now possible. Gladden's ability to anticipate the requirements of the aircraft industry has made Gladden a leader in the manufacture of brake control units. Today Gladden is to quality protection as the three major types of break-control units....

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S-300 . . . 300,000 Btu/hr rating. Weight, 22½ lbs. Dimensions, 27½" x 9". "Workhorse" of general aviation heaters . . . you'll find it in the DC-4, C-46, C-54, C-114, Constellation, PV-1, and Lockheed transports, and corporate conversions, in this size range.



S-300 . . . 300,000 Btu/hr rating. Makes use of Janitrol's famous "radiant tube" principle of combustion. Weight, 27 lbs. Dimensions 23½" x 10". Now in use on C-119s, C-120s, DC-3s, Super DC-3s, and many other famous larger aircraft. In some multi-unit installations S-300s supply more than 1,000,000 Btu/hr—and singly or in multiples, it will heat practically any private aircraft heating need.



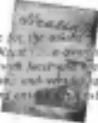
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EQUIPMENT



THEY PRESENTED PAPERS—From left, D. M. Moore, Convair; R. Nelson, Boeing; W. W. Thayer, Douglas; L. B. Koenigsmann, Lockheed. At right is Vickers' F. T. Harrington.

Experts Examine Hydraulic Trends

Vickers conference hears papers delivered on Boeing, Convair, Douglas and Lockheed transport aircraft.

By George L. Christian

Detroit—Latest design trends in hydraulic components, valve research with electro-magnetic hydraulic valves, and new developments in flexible seals were among the subjects discussed at the Transport Aircraft Hydraulics Conference held here recently under Vickers, Inc.'s sponsorship.

The conference attendance was close to 100, including representatives of the major aircraft manufacturers, and related industries. Chairmen were F. T. Harrington, hydraulic systems engineer, Convair Air Lines, and R. E. Stappell, hydraulic system engineer, Canadian Car and Foundry.

Paper Presentation—Four papers were delivered at the conference. Convair meetings have usually been question-and-answer discussions often. One of the papers—an analysis of the hydraulic system of Boeing's 707 jet airliner/transports—was covered in detail in Aviation Week Dec. 6, p. 80. Brief summaries of highlights of the other three papers presented at the meeting follow:

- Modification of the Model 340 Multi-Hydraulic System to Improve General Cooling Operation, by D. M. Moore of Convair.

The modified hydraulic system provides these advantages:

Hydraulic system unloading cycles have been reduced by 94%; pressure peaks in the return system have been

halved, gas traps and brakes could feed the pressurized system in case of failed boosters, and pump efficiency could not be lost in the secondary system.

Other improvements include the modification of Vickers' new lightweight hydraulic pump and the incorporation of an electric motor-driven hydraulic pump for emergency landing gear retraction and brake operation.

Highlights of the question-and-answer sessions follow.

Pumps & Motors

Vickers said that the basic design criteria of variable displacement by electric pump permits a certain flow in a job of 1,100 to 1,200 hr., depending on the pump operating at 3,000 rpm. Fringe problems in cabin supercharger drives are expected to have a life expectancy at least equal to the supercharger drive and other components.

P-Long-life Arms—In related practice, cage-mounted pumps that are used to supply a plane's main hydraulic system have a life range from 1,100 to 1,800 hr., according to Vickers, unless unusual wear factors are to large a gauge as far as a cage's overhead period.

Thus, West Airlines commented that Vickers' goal should be to produce a pump that can operate for 10,000 hours. In fact, Vickers apparently has matched with several pump models, according to the audience.

In regard to hydraulic valves, Vickers said that it has two improvements in the works. The pump block is now being made out of an aluminum-aluminum alloy instead of bronze base. The new blocks have stood up well in qualification tests, according to Vickers. And the cylinder bases are being given a "beveling" finish to give the bases a surface finish of 5 micrometers. These two changes should help substantially in prolonging motor life.

Hydraulic Fluids

From discussion at the conference, it was apparent that ferro-silicate dielectric fluids are not taking the aviation industry by storm. It also appears that Monsanto's Staphyl is on the lead.

The final was recently accepted by AFSC for cabin supercharger drives on production Douglas C-118As. All existing C-118As soon will be converted to Staphyl in the field, according to Monsanto spokesman. The Navy is considering making the same change, Monsanto says.

Low-Temperature Fluids—Monsanto indicated there is considerable interest in England in its low-temperature version, 20 and 30, which temperature range is from -65 to 230°. Staphyl

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There were more than 66,000 bona-fide readers for a typical issue of *AVIATION WEEK*... 14 readers per copy who passed a self-recognition test... readers who can prove they really read?

Advertising Research Foundation measured that fact and a host of others about how *Aviation Week* is read—how editorial material is read—how advertisements are read—and how readers influence purchasing—in Study Number Six, The Continuing Study of Business Papers, just released. Together they make up one of the most impressive series ever told about readership in the aviation industry.

The study was conducted by Advertising Research Foundation, because of its industry-wide importance, on behalf of some 190 leading advertisers, agencies and media—including the American Association of Advertising Agencies and the Association of National Advertisers—which comprises the Foundation's membership. Findings were secured through methods developed and tested by ARI during two years of experimental research and used in actual studies of five other leading business publications. Because of these painstaking procedures and their absolute freedom from bias, Advertising Research Foundation studies are considered to be the most valuable research on magazine readership available today.

True *AVIATION WEEK* representatives will be glad to give you full details.

*Paid circulation of the issue studied by ARI (April 5, 1954) was 47,375. Paid circulation of current issues exceeds 60,000, on this same basis defining more than 70,000 readers who really read?

B-50 costs \$3 a gallon more than standard Skymelt.

Sky melted Monsanto fuel, CG-45, is attracting interest in military circles, the company reports. In some cases the military are more interested in a high temperature fuel than a flame-retardant fuel and CG-45 was developed to meet that need.

Hohmann's firm suggests hydrafite base fuel, H-2, a still being sold in some government Navy aircraft, but it is not being pushed, since it is a costly product, including United and Avco. PAA also sells Skymelt. PAA says that it has a severe problem with Skymelt getting into insulation sys and needs to know if Monsanto can come up with a good coolant.

► **Users' Complaints:** Here are some comments made by various firms concerning Skymelt:

► Douglas: Skymelt apparently lacks stability under certain loading conditions. Case in point is the windshield wiper assembly on DC-3s where fuel loads are applied on a hard bumper rack rating in a soft vibration body. Executive vice mngt. Douglas skyrocketed the cost, because while the body looks good, it does not fit the parts and needs to alleviate this trouble.

Douglas says that it will continue Skymelt tests on any new intended to work as is with the fuel if the user's vendor cannot offer a Skymelt test batch. Tests must be performed before components are allowed to be incorporated in aircraft hydraulic systems.

► Delta-CMS, National: Didn't experience any difficulty in using Skymelt's system.

But United's representative says company feels that the significant quality of the fuel, especially when stored in the calor exchanger, is the system is worth the extra cost.

► Delta-CMS: Crit'Alac point, made by the French Paint and Chemical Co., Gardeau, G.M., is giving excellent operating temperatures results.

Executive laboratory tests have shown that it takes three days of exposing the fuel at a constant temperature of 110°C to raise the self-ignition to 3.0. The company says that maintenance operation at over 90°F is required to run Skymelt.

► Douglas vs. Fairchild: Douglas, which did a considerable amount of work in the original development of Skymelt, underscores the fuel's whiteness and color and strength on its label.

The Douglas rep calls a fuel his company made in which "Aviation Week" hydraulic fluid is mixed with a combustible amount of oil to form a fuel using Skymelt with a 1950 inlet temperature without encountering any safety problems. "Skymelt life is excellent," he said.

► **Wor. Coverage:** In west covering to protect insulation against Skymelt, United says that heat-pumped polyethylene coating gives excellent protection against both Skymelt and mineral oils. The adm's experience with light-painted in green in nylon is not satisfactory. Yet KLM and America find spray on nylon gives adequate protection.

Other comments concerning Skymelt:

► Lockheed: Has no limited test; the fuel is not approved.

► Boeing: Currently conducting tests at

using what used in Skymelt-infused resin, the carbon report. It is about completely resistant to Skymelt's pumping characteristics. United claims that the paint is good, but does not see it because of the paint's prohibitive long drying time. "When on the job, it gets off paint," Monsanto advises (but a different type of paint is required with Skymelt 500), when and at high (100°F) temperatures.

Spartan is somewhat unpleased that Skymelt poses a problem when it is an aircraft fuel system, especially when brains are packed and the fuel is exposed to the high temperatures of jet and boost. However, both Douglas and Monsanto say they first have tested the fuel on basic systems of DC-4 aircraft and have had no problem.

► **High Temperature & Acid:** Several entries commented on Skymelt's reported tendency to turn red when exposed to high temperatures. Rankin has noted this tendency on its operations while United has had acidity problems in its Skymelt test bench.

Here is Monsanto's view on acidity and high temperatures as reported by the company's representative: "In fact, our tank fuel Skymelt can go beyond 100°F without experiencing temperature shifts which go to 225°F in an open hydraulic system and 44 to 235°F in a closed system. Yet a Monsanto ranking any attempt to run Skymelt's system exceeding temperature limits."

Executive laboratory tests have shown that it takes three days of exposing the fuel at a constant temperature of 110°C to raise the self-ignition to 3.0. The company says that maintenance operation at over 90°F is required to run Skymelt.

► Douglas vs. Fairchild: Douglas, which did a considerable amount of work in the original development of Skymelt, underscores the fuel's whiteness and color and strength on its label.

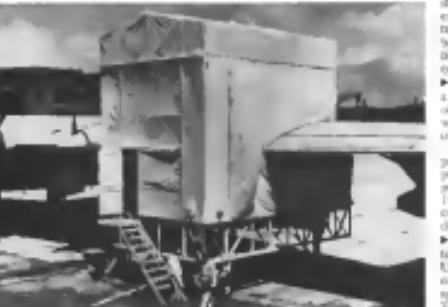
The Douglas rep calls a fuel his company made in which "Aviation Week" hydraulic fluid is mixed with a combustible amount of oil to form a fuel using Skymelt with a 1950 inlet temperature without encountering any safety problems. "Skymelt life is excellent," he said.

► **Wor. Coverage:** In west covering to protect insulation against Skymelt, United says that heat-pumped polyethylene coating gives excellent protection against both Skymelt and mineral oils.

The adm's experience with light-painted in green in nylon is not satisfactory. Yet KLM and America find spray on nylon gives adequate protection.

► Lockheed: Has no limited test; the fuel is not approved.

► Boeing: Currently conducting tests at



New Wrap-Around Shelter for B-36 Servicing

Av. Force has placed an order for a "fully automated shelter" of three new 120-wrap-around maintenance shelters for use by Convair B-36 ground crews. The second shelter is taken only for months to service the aircraft in place, the other two serve as steel-shuttered passageways to around

with nylon curtains that can be lowered sharply around the aircraft's structure. Space is sufficient for storing a propeller 160 deg. or for removing an engine or prop. Maintenance of the weight-light waste incinerator skid. Everts Engineering Co., Bellwood, Pa.

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Years of experience in fabricating stainless steel, aluminum alloys and other allied materials have earned Lavelle a reputation as a truly unique and reliable subcontractor.



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the customer's option.

- Minnesota, operating an engine, "Skydrol used \$75,000 when used in 75 cubic supercharge drive systems."

Seals

Some of the highlights concerning hydraulic system seals:

- New Delta® O rings offer better sealing characteristics than standard, round-shafted O rings. However, they also offer more resistance to passes and cuts.

The Art Fouse advises that it has experienced with the Delta O ring in the antigravity landing gear struts on B-17s. Delta rings did not give as good results as standard rings so the Art Fouse resorted to the round O ring. Another disadvantage of the ring is that it can easily be twisted upside down.

FMA says that Skofield seals are already utilized by heat and cold when better seals would be made available. Designers recommend that part of the answer is in better quality control which should result in 72 hr. net (approximate) 100% SAE 40.

Galvin Rubber Co., a major supplier of O rings, says that O rings should be used in marine applications, ignore section seals in static use.

Aircraft Hose

Two major aircraft hose suppliers, Armstrong and Westinghouse, give these details of developments in their plants.

- Armstrong revealed that it has two radically new, high temperature hose developments in the works, but cannot disclose which it is using yet. It has a choice of what kind of fluids tell what maximum temperature the hose will have to handle.

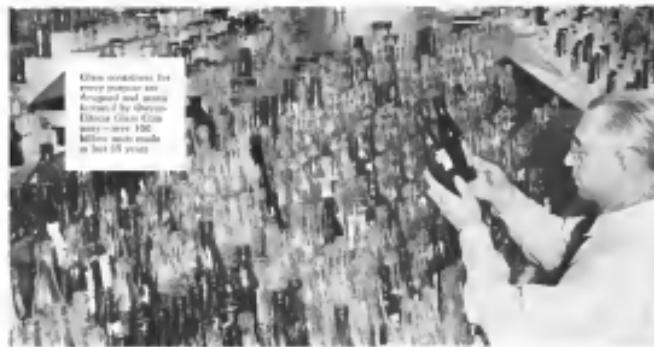
- Westinghouse is working with three different types of hoses. The company says soon it will be able to supply 4-in. hose capable of withstanding pressures up to 6,000 psi with a 1235° temperature overload. It also hopes to have a non- -49 MIL-5511 hose available by the first of the year for propeller feathering applications. The company has developed a 3/8-in. hose which it believes will withstand 6,000 psi with a 1235° temperature overload for 100,000 cycles. The line is not yet set for production.

Armstrong also has a hose construction which looks suitable for such pressures, but says it has had no inquiries for 6,000 psi hose.

Sidelights

Minnesota's newest product concerning forming: Conflatbore with boltable metal flange brought out the following:

- TWA will allow flex flights with one



More than 3,000 new designs per year —without a "bottleneck" in drafting

In the Design Development Department of the Owens-Illinois Glass Company, Toledo, Ohio, no time is lost in tedious drafting. A simple short-cut involving the use of Kodagraph Autopositive Paper and Kodakith Film gives engineers fast results . . . sooner drafting every day. Chances are you can adapt this technique to your own situation.



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A positive photographic intermediate is produced directly from the "lead-out" on acetates with Kodagraph Autopositive Paper. This saves time, paper, film and drafting equipment. So, instead of . . .



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Douglas B-66 takes off at Long Beach, California, for its first run. Its electrical system was designed by G-E power-generation engineers to deliver rated load while 80°C cooling air.

GENERAL ELECTRIC



Side view of bomber shows sleek B-66. It is first production aircraft to have an elevated ambient temperature air-electric system.

Latest Air Force bomber has new G-E engineered power-generating electric system

NEW GENERAL ELECTRIC ENGINEERED SYSTEM MEETS DOUGLAS B-66 OPERATIONAL DEMANDS FOR HIGHER AMBIENT TEMPERATURES

A new air-electric power-generating system has been developed by General Electric to meet the operational demands of the Air Force's newest light bomber, the Douglas B-66. The system consists of three major components: high efficiency alternators, static voltage regulator and generator control and protective panels.

DESIGNED FOR HIGH PERFORMANCE AIRCRAFT

With a generator that can operate at high temperatures of up to 100°C, the new system is designed for long-life and efficient performance. The alternator or regulator has no moving components to wear out, and under laboratory testing at 100°C without load, 3000 hours of operation without maintenance.

Regulation is precise, and requires no pilot adjustment of voltage or load division. The control panel supplies the automatic control of start up, shut down, and maximum protection against ground faults, over and under voltages, and open phase.

SPRING TAKE-OFF, SPARES FEAT

The new equipment begins operating as soon as the pilot starts the engine. The system contains only two total weight components which may be removed in less than 15 minutes. This eliminates several hours of pilot downtime and sharply reduces the time required to locate subscrews. Under normal conditions, fault clearing and resetting are fully automatic.

SINGLE SOURCE FOR COMPLETE SYSTEMS

General Electric offers a single source for complete air-electric power generating systems and related power drives for most aircraft. For more information, contact your nearest G-E aviation specialist, or write Section 210-82, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Static regulator (left) maintains constant alternator output voltage. Control and protection panel (right) helps locate and isolate faulty generators.

New B-66 high-altitude air generator has an harmonic over 10%, produces full rating when exposed to high temperatures in high-speed aircraft.

Tests of system showed hows excellent protection over voltage, over and under excitation, ground faults, and cycling, different current, and open phase.





- Solid and Liquid-Propellant Rocket Propellants for Missiles and Aircraft Applications

- Thrust Reversers
- Auxiliary Power Units and Gas Generators
- Electronics and Guidance
- Guidance Systems
- Explosives Detectors and Wreckers
- Underwater Propulsion Devices
- Aerostatic-Engines Engines for Test Facilities

Here's another Aerojet-General JATO (jet-assisted takeoff) made for a specific task—to get heavy bombers/bomber-bombers into the air quickly, safely, and with full payload.

To-be-made for the task, yet, but now-produced by Aerojet-General with the same high quality, excellent reliability, and broad operating characteristics proved time and again by over 300,000 rocket powerplants produced by Aerojet-General to fulfill specific needs.

This new high-thrust, short-duration JATO—designated the SKS-1500—developed by Aero-

jet General in cooperation with the U.S. Navy Bureau of Aeronautics, is one of many different solid-propellant rocket units produced by Aerojet-General to fulfill specific needs.

If you are concerned with missile powerplants or boosters, oriented takeoff or in-flight thrust augmentation for piloted aircraft, auxiliary power supplies, gas generators, turbine starters, pilot ejection, or any problem that demands full power within a second, Aerojet-General's rocket power specialists are ready to assist you.



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MOVE POWER FOR AIR POWER

lally, the unit's fuel tank can be re-used so the aircraft's fuel system to provide extra transfer fuel should it be required after the "peak" the unit's torque will have exhausted.

In the photo (p. 40), the hose has been extended a short distance to show the drogue attachment into which the part of the nozzle to be refueled fits into the probe. The probe can be easily released from the base of the nose-cone of an aircraft; it can also be positioned on the leading edge of the wing, on top fairings, or elsewhere.

The unit can be installed in 10 minutes, its maker says.

OFF THE LINE

Aerojet Corp. has opened a branch facility at Newark Airport. Designated to serve customers in the New York-New England area, the branch will have an office to handle spare parts sales for 16 manufacturers. Sales office will be in Building 25 on the east side of the field.

A 30,000-lb. drop, impacting force of about 1,000 G's, failed to damage two new 5-kilowatt electrical batteries made by Eastern Electric Corp., the New York firm. One of an 40-amp battery was carried 54 miles high by a research balloon. At 30,000 ft. an underground park was selected. Due to puncture failure, the entire pack, including the 5-kW battery, plummets to earth. When recovered, the battery's storage cells showed only max. discharge in the beginning—the battery itself retained full output and performance characteristics, according to Tieday.

Test, repair and general servicing facilities for aircraft parts are being established in the Los Angeles area by Price Products, a division of Pacific Research Center. The part is the second acquisition of Bob Wiley aviation interests on the West Coast, the company having already acquired Western Industries, Inc. Address of the Service Center: 5521 Clinton Ave., North Hollywood, Calif.

An Allis-Chalmers testing facility recently opened 14,200 square feet in a United Air Lines' DC-6 without overhead. Retired test set up during a test of gear packed bearings used in the machine where the machine operated at approximately 17,500 rpm. Allis-Chalmers claims the test set up was so well designed that the parts were still in serviceable condition, met all specifications, and the radius to all approaches could have operated for a longer period without trouble."

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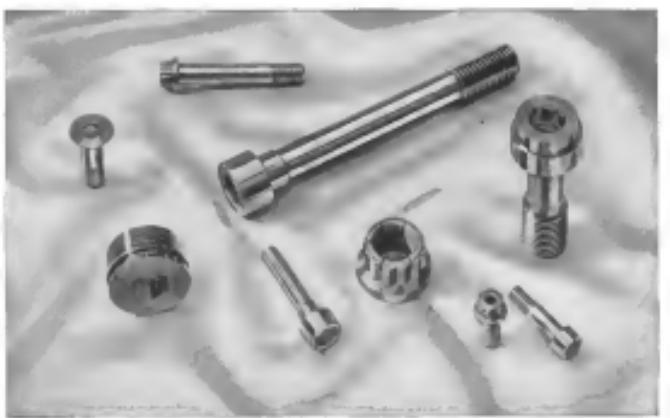
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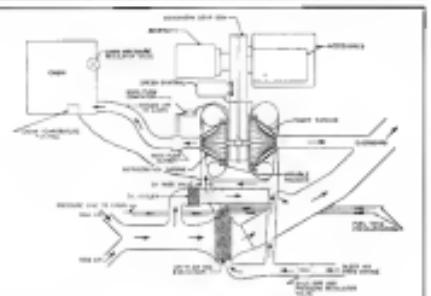


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AIRCRAFT PRODUCTS DIVISION



NEW AVIATION PRODUCTS



Two-in-one header inlet or conditioning, provides economy thru power.

Twin Turbine Supplies Air, Power

A new turbine system, developed by Hyd-Aire under contract with a major aircraft manufacturer, provides both air conditioning and auxiliary drive power for aircraft.

Known as Freebreze, it is reported to be the first twin-turbine system to combine these functions. It is designed to supply rapid cabin temperature change units in a large range of aircraft configurations, while developing shaft power at constant speed in accordance with constant or variable load requirements.

> **Better Breathing.** By reducing two turbines instead of one, the Richard, Calif., manufacturer has gotten significant changes for the refrigeration requirement without compromising for the variable power requirement. In turn, any output required is not penalized by loss of available energy resulting from loss of heat through a heat exchanger with increased thermal bypass pressure due to cabin pressurization needs.

No effort is reported to be a more efficient use of bleed air for a given set of requirements over a range of operating conditions.

Basically, the system consists of two turbines mounted on a single shaft, a one-hp, heat exchanger and control shaft. The cooling turbine wheel is a high-performance, radial-flow, clearance air flow unit. Small is the low-pressure type. Variable nozzle air turbulence profiles supported on individual bearings.

Power turbine wheel also is a high performance, radial-flow design using an stainless steel shell. Scrubbed and venturi

The control system then regulates the additional power required from the other turbine (power turbine), so, if there is excess energy, causes the power turbine to set in a fixed.

If the cabin temperature drops below the desired level, the bypass valve automatically (at pilot's discretion) reduces a portion of the air passing through.

The Freebreze package, as far as developed, provides an air-conditioning rate controllable from 30 to 90 ft³/hr. max. with load from zero to 50 hp

Pilot Light Assemblies In Subminiature Series

A series of pilot light assemblies a little over 1 in. high, consisting in a single 15/16-in. clearance hole and requiring no sealing washers, provide illumination equivalent to that of the incandescent lamp housed in a heat plastic tube which the bulb extends.

Two terminals are provided. The mounting bracket may be grounded to the panel and the integral connection of the subminiature pilot light completely isolates the lamp current from the ground. The series is designed to use six of five standard incandescent lamps (maximum ratings of these will ages 13, 27, 40, 14, 8 and 2.8).

Optical beam is transparent, light diffusing or completely diffusing. Clear or any of six colors may be specified. Delight Corp., of Stewart Ave., Brooklyn 77, N.Y.

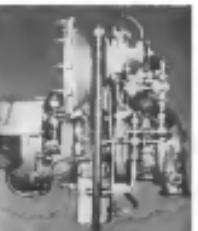
Easy-to-Use Shift Lever Feature of New Metal Lathe

A lathe designed to meet the needs of tool and die shops and industrial working facilities is the first product of its kind being built by the Delta Power Tool Division of Rockwell Manufacturing Co.

The lathe is an 11-in. center model with 24 in. capacity between centers and 1 in. center capacity. Diameter of the hole through the headstock is 18 in.

One feature of Delta's new product is a patented back gear shift lever located so that the operator can switch it easily and shift from direct spindle drive to back gear spindle drive, loose or locked spindle, without using wrenches, pulling out pins or opening guards.

The machine also has a perfected one-speed drive, the company notes, offering a 44-to-1,339 rpm speed range with an infinite choice in that range, without turning off the machine to change speeds. Difficulties formerly associated with viscous speed drives, such as side wear, have been eliminated in the master switch, enabling the user



TWO-IN-ONE TURBINE UNIT makes a cost of bleed air.

Consumer Prices Vs. Airline Receipts

Consumer Prices
Airline Receipts
1933-1954

	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	
Source: Consumer price index from Bureau of Labor Statistics; airline revenue average from CAB Statistical Board book, <i>Average airfares—1940-55</i> from Farn's 41; 1953 4th annual airline statistics, CAB.																							
1933	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
1934	100.2	97.8	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6	98.6
1935	113.6	95.6	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2	116.2
1936	117.2	106.1	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3	117.3
1937	108.9	108.1	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4	107.4
1938	108.4	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9	108.9
1939	108.6	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8	108.8
1940	108.2	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5
1941	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5	108.5
1942	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1943	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1944	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1945	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1946	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1947	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1948	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1949	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1950	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1951	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1952	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1953	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4
1954	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4	108.4

* Estimated.

Sources: Consumer price index from Bureau of Labor Statistics; airline revenue average from CAB Statistical Board book, *Average airfares—1940-55* from Farn's 41; 1953 4th annual airline statistics, CAB.

started at this latter point and added Johnson has much of a percentage increase it reflected. He referred from further questions on the subject when Johnson referenced him that it reflected more than a 1,000% jump.

► **Taipei.** —Taoiseach—Tobacco and another cigarette area, that of traffic delay. He told the Board that ATA moved 150 capital assets acquired by CAB. At many eight of these flight delays of 18 days or longer totaled US\$1. In 1948 was about the year Jan. 30, 1952 to June 30, 1954.

Based on the data available operating expenses were about 10% of the eight delays, which totals the amount of the eight delays on the airlines \$742,000. The ATA chief reported that "considerably you can into the capital expenditures necessary to provide for some effective electronic equipment."

► **Staggering Costs.** —Looking over records of those last three years he said, "the record shows that one of the major airline declines were rate increases alone of an added 10 million in 1953 expense. Gasoline prices received during that year by \$1.1 million. Depreciation rose \$4.2 million. Training costs increased a comparable amount, aircraft maintenance, the Company, was \$776,000."

"These are the kind of costs we have been making into."

"We are not going to stop or expand. We are going to grow faster and we expect that padding will still get more and more expensive. But we also recognize that when the airline fleet will total 3,300 planes down the road that year and with additional route extensions of airports, such as can be done producing 25 DC-7s, we run into those which are staggering in total with

the introduction of each such move."

► **50% Increase.**—Johnson then referred to update electronic equipment as still another illustration of rising expense items. He pointed out that in 1946 it cost \$10,000 to install telephone electronic equipment in one aircraft. The equipment consisted of two units and weighed 270 lbs.

"By 1950 we experienced a 50% rise in cost to \$100,000 and a possible rise in cost to \$150,000 in a possible period of time. This is a major item in the cost of aircraft equipment," he said.

► **Investor Relations.**—The last part of Johnson's presentation was directed to the future of airline industry's funding in view of the financial resources available to airlines to attract sufficient investment to sustain the growth of the airline industry.

North American Airlines still is fighting hard for its life. With its position weakening steadily in the face of the increasing number of smaller airlines, the lending market for airline credits is becoming stronger. In what was described as "a difficult task," it is going down investing hard.

Last week the regular monthly discussions concluded with introduction of 100-seat DC-6B regional transoceanic coach service (Aviation Week Dec. 13, 1951). Earlier it announced a \$1-million advertising budget for next year.

► **Scheduled Flights.**—North American makes no secret of the fact that it is unable to compete in route services. Its new DC-6B schedule calls for scheduled daily round-trip flights between Los Angeles and northeast destinations from New York, with a stop at Chicago.

Douglas, with an eye on its relationships with the scheduled airlines, made its public announcement with the delivery of the new ship to North American.

The 100-seat design was attracting considerable interest in Douglas' home town. Seating was standard coach-type configuration with three forward-facing seats on one side of the center aisle and two on the other.

he attributed this problem to the static fuel load. He previously had covered this subject in a talk before the New York Society of Security Analysts (Aviation Week Nov. 12, p. 8).

"What we really need," he told the Board, "is to achieve earnings stability,

to make adequate financial reserves and pay dividends."

If the decision were ever come

to

CHALLENGING OPPORTUNITIES FOR CREATIVE ENGINEERS

WITH A



WEAPONS INTEGRATION NEEDS OUTSTANDING ENGINEERS FOR SUCH IMPORTANT POSITIONS AS:

CHEF OF SYSTEMS DEVELOPMENT

GENERAL SUPERVISOR OF ELECTRONICS SYSTEMS LABORATORIES

Engineers with experience in Aerodynamics, Electronics, Structures, Mechanics, Materials and Processes, and Dynamics. Advanced degree required for many of these openings.



If you are interested in a growing weapons systems organization, write full particulars to E. J. Hedin, Jr., Engineering Personnel, Temco Aircraft Corporation, P. O. Box 4100, Dallas, Texas.

J-M Clipper Seals fly with the Sikorsky HOSS helicopter...



Clipper Seal being installed in the gear housing base of the Sikorsky HOSS helicopter to seal oil in, keep abrasives out.

...seal oil in, keep abrasives out, at critical locations

To retain the lubricant vital to its complex rotor and gear systems . . . and to protect bearings against the infiltration of abrasives . . . the new Sikorsky HOSS helicopter depends on these positive sealing qualities of Johns-Manville Clipper Seals.

Clipper Seals are flexible—made of special compounds, they have a tough, dense body and a soft flexible lip conveniently molded into one piece.

Clipper Seals reduce friction—A specially designed guitar spring holds the lip in tight but fine contact with the shaft. Thus a positive seal is always maintained but shaft wear is reduced and bearing life is increased.

Clipper Seals are corrosion-resistant—The molded body is entirely non-metallic, is therefore unaffected by chemicals and most forms of corrosion. And the guitar spring is available in various corrosion-resistant metals.

Clipper Seals are versatile—They can be furnished in flange sections of varying widths to fit practically any casting. Various lip designs are available . . . and various lip compounds provide the proper hardness for temperatures down to -45°F to +550°F.

To find out more about Clipper Seals and their applications to your particular sealing problems, write Johns-Manville, Box 66, N.Y. 16, N.Y. In Canada, 199 Bay St., Toronto 1, Ontario.



Photograph and cross-section of Type LPD Clipper Seal. This is just one of many designs available to solve tough sealing problems.



Johns-Manville

PRODUCTS for the
AVIATION INDUSTRY

10-Hour Nonstop

Long transoceanic flights will be able to employ nonstop transatlantic routes under a proposal. Civil Aviation Board estimates at the 10-hour flight duration is standard.

The proposed route in the time as fast now applied to scheduled aircraft but would speed certain communications services for safety purposes.

Some 100 hours of nonstop flight under a special Civil Air Regs. later would be less than that extends the flight time limitation from eight to 10 hr. as permitted aircraft carrying two pilots and a flight engineer. The special route will become effective when final action is taken in promulgating this limit.

The original application must have a CAB-approved independent air-ground communications service and dispatch information strong, learned persons. Systems would be similar to those in present-day commercial aircraft.

Board action came as the result of a request by North American Airlines for the extension.

There is no plausible reason for not having non stop in paper, naval orders, they have taken refuge in some calling. When basins and wild statements are made by officials who hold positions of responsibility, the public should be alerted.¹¹

Revising Routes—We're concerned that in this case, caused by CAB has had to "trade" two good nonstop proposals.

• NAA upholds traffic and revenue from other carriers.

• The number carrier has much profit.

On the first point, WPA says it is unique airline created its own market by pioneering the approach field. If there has been any decreases, it has been the repositioning of business from North America to other carriers who have adopted methods and techniques which we've isolated.¹²

WPA contends the certified industry has expanded 40 times since 1945. Citing the yearly rate growth, he was CAB has helped the scheduled airlines to increase their traffic and revenues by protecting them from competition and parochialism through legislation already.

"The change is made that North American has made a profit," WPA says. "It'll believe the Board to cast decisions on such profit when it comes not from solely, not from inflated and over-priced mail, nor from U.S. Treasury, and not from ever-increasing the public."

He claims North American's profit last year was derived largely after the carrier had lost nearly \$10,000 per



TEA'S FIRST VISCOUNT at Montreal Airport Dec. 12 after flight from Britain.

Trans-Canada Gets First Viscount

Toronto—Trans-Canada Air Lines' first Viscount Viscount arrived here last week after a trans-Atlantic flight from Prestwick with a one-day stopover at Keflavik, Iceland.

With Viscount chief test pilot G. B. Weller at the captain's seat, the four-engine prop made the nonstop at an average speed of 303 mph. TCA's flight safety incident, George B. Lubman, was in the co-pilot's seat and C. R. Edwards, Viscount's managing director and chief designer of the Viscount, was among the passengers.

• **Schedule Setback**—The aircraft originally intended to enter into revenue about six weeks ago but because Trans-Canada's maintenance took longer than expected, the second aircraft is slated to arrive in early January with the remainder of the 12-plane fleet arriving at two-week intervals. TCA expects to have 14 by early May.

The delay in delivery has set back the schedule for beginning of regular flight operations, according to TCA officials. Initial service, Montreal-Toronto-Winnipeg, now will begin in late January "at a lower fare than any currently carried carrier under CAB."

Airlines Back U.S. Tourist Travel Plan

Tour development programs are planned based in South America, prepared by the U.S. at the world meeting of the Inter-American Economic and Social Council in Rio de Janeiro, has the main thrust being that of Air Transport. ATA president Earl Johnson says signs recommended by the U.S. at the meeting included "the availability of tourist promotion offices in some major U.S. cities, provision of

adequate advertising budgets and construction of hotels in key Latin American tourist areas and the elimination of unnecessary discriminatory requirements."

Air France—Pay Plan

Air France is entering passenger air travel with a "Travelers Plan," offered in conjunction with the Chemical Com Exchange Bank of New York. No down payment is required, and terms are available for 12, 15, 18 or 24 months. The plan will operate only in New York at first, but the French carrier eventually expects to include all of the United States and Canada.

Macklin Spells Out Airlines Defense Role

Major role of the airlines in any future national emergency will be to tap the "common stockpile," the static productive capacity of the U.S.-wide airline defense applies to trouble spots. Frank J. Macklin, director of Air Transport Assn.'s military bureau, sees:

"He adds that the emergency potential of the scheduled airlines is an direct reflection of the continuing growth of their passenger traffic."

► **Airlines Future.** Macklin is confident of airlines growth, and he makes the following prediction:

• By the end of 1954, scheduled air lines will have flown 34 million passengers (19 billion passenger-miles).

• In 1965, airlines will be carrying about 87 million passengers, more than half the population of the U.S., approximately 27 billion passenger-miles.

• Airlines should be carrying about 225 million ton-miles of mail by 1965, an increase of 158% over 1953, and about 551 million revenue tons of cargo, a gain of 124% over 1953.

• By the end of this year, more than 100 airports in the U.S. will be using the airlines.

Macklin says that by the late 1950s

passenger transports should be operating on some longitudinal transconus which will, later, on transoceanic runs.

► **Schedule Base.** The ATA official says the "stage-off-stage" process of the development of a mobilization base appears to be over.

It appears that we are now beginning to realize that the banner of strategy-at-mobilization—should be given just in context and while a place in strategic basing is the ultimate economy.

Under current mobilization planning, the scheduled airlines have secured 30% of their strategic aircraft to support the strategic mission.

• More than 100 of these planes have undergone modification to make them adaptable for military use at 45,000' altitude. In addition to this steady fleet, the scheduled airlines' training aircraft of approximately 1,000 are available for defense purposes.

Railroads Lose Round In Mail-by-Air Battle

The railroads lost the first round of their legal campaign against the surface mail-by-air program last week when a federal judge rejected their request for

a temporary injunction to halt the West Coast experiment (AVIATION WEEK Dec. 12, p. 18).

In deciding the suit, District Judge Alexander Holtzman found that public interest factors of service outweighed any judicial losses.

The legal question involved is the rail still able to be recovered. No time has been set for hearing, but the railroads may take action to have the case heard by the end of next month.

► **Delivery Speedups.** Milwaukee Postmaster General Arthur E. Sonnenfeldt announced the West Coast experiment has advanced mail delivery as much as 40% in the first two weeks of operation.

Sonnenfeldt stated that "improvements received have daily by the department achieve in the West Coast mail-in experiment on the Pacific Coast shows that mail handled well as being advanced 24 hr in delivery and in some cases 48 hr." He said, "Delays of considerable time, on the basis of experience, show similar advances in most markets."

► **21,000 Tons Yards.** The railroad research program also is going successfully in the East, according to Sonnenfeldt. He said the outcome of the West Coast adult roundout will be implemented on a nation-wide basis.

The Post Office Department estimates the West Coast experiment will carry about 200 tons of first-class mail annually. Mail is being flown in other segments of the project at the rate of 13,000 tons a year.

The combined East-West operations will be carrying about 73% all out-of-town 3-cent mail.

NOTICE

TO WHOM IT MAY CONCERN:

One W. E. Powell of Zurich, Switzerland, has been representing himself to be an agent of the TEMCO AIRCRAFT CORPORATION; has circulated letters and advertisements in the name of TEMCO AIRCRAFT CORPORATION; has in other ways assumed to be an agent of TEMCO AIRCRAFT CORPORATION.

Notice is hereby given that TEMCO AIRCRAFT CORPORATION has never authorized W. E. Powell, or his associates, to represent TEMCO AIRCRAFT CORPORATION in any manner or form whatever. The assumption of such purported authority is hereby denied and repudiated without limitation.

Any person or persons acting upon the aforementioned or other representations will do so at their peril.

TEMCO AIRCRAFT CORPORATION
DALLAS, TEXAS, U. S. A.
Robert McCallum, President

[Editorial comment]

CAB ORDERS

(Dec. 18)

GRANTED

► **Trans Alaskan.** Application for a temporary exemption to transport mail passengers on the Trans-Alaska Pipeline System was granted by the Federal Aviation Admin.

With Alaska's application for an exemption to operate between Ft. Yukon and Arctic Village, Alaska, and east Gulkana as required in the state Alaska air routes zone.

► **West Indies.** Application for an exemption to transport passengers to and from Spanish Caribbean ports from San Juan, P. R., for one year is valid 30 days after a decision is rendered in a case involving a certificate for any of the specified routes.

APPROVED

Interagency agreement involving Capital Airlines and Trans World Airlines and other carriers.

► **New York Airways.** Flight pattern change, route property rights between Newark, N. J., Newark, and Rutherford, N. J., and between New York's LaGuardia Airport and Rutherford.

AMENDED

Delta C45 Air Lines' certificate of registration to Trans West Host, Inc., while Lake Control Airlines serves that point.

GRANTED

► **Transwest.** Air Lines have filed for service license from New York, Washington, D. C., and Philadelphia, N. Y., suspended and its investigation of West Indies.

DENIED

► **Transwest.** Air Lines have filed for service license from New York, Washington, D. C., and Philadelphia, N. Y., suspended and its investigation of West Indies.

► **Eastern.** Eastern Airlines' application for an exemption to operate in the Eastern-Central coastal area.

The petition concerned certain changes in frequency in CAB findings and in aspects of expanded routes. The Board finds the proposed frequency is largely substantiated and that route already is under way.

DISMISSED

► **Interstate.** Interregional of a Western Air Lines fare increase since the fares have been canceled.

SHORTLINES

► **Pacific Air.** Division of Railway Express Agency has reengaged scheduled service to Pasco and Pasco, N. J., at New York, Newark, Rutherford, New Jersey with direct flights with the rail express nationwide. NYA will use New Jersey hubspot No. 1 in Rutherford, N. J., as a terminal for the service.

► **Flying Tiger Line.** Domestic freight services in November increased 5% over the same month last year. Traffic volume totaled 5902,000.

► **International Air Transport Assn.** Its clearing house reports September billings \$101,587,000 for a new monthly record in the U.S. August flight tonnage increased 10% over the previous record set in September 1953. Clearances for the first nine months of 1954 reached \$210,587,000, an increase of 13.1% over last year.

► **Southern Airways.** Reports arrival in excess of 100,000 passengers in November. Southern carried 12,315 passengers and flew 2,644,000 passengers, with increases of 35.1% and 14.3% respectively. Load factor of 38.3% also set a company record.

► **Twa World Airlines.** Plans a year-long world-wide celebration as 1955 begins, 9.9% rest of operation.

► **United Air Lines.** Will inaugurate DC-7 service between Pacific Northwest and Midwest and East next month Seattle/Tacoma-New York service will be offered on a 94 hr. schedule.

Gen. Vannier, wing leader group lead, makes banner cyclic fly by test on wing station of C-130 transport. The aircraft has temperature range of -40° F. to +130° F. and maximum air speed of more than 230 mph.



New icing tunnel speeds thermodynamics research at Lockheed

Designed to meet a constantly increasing volume of thermodynamics work, Lockheed's new icing tunnel now provides year-round testing in meteorological environments normally found only in flight. It is the first icing research tunnel in private industry.

Lockheed thermodynamics scientists are now able to study in greater detail problems such as thermal insulation, cyclic deicing, various methods of ice removal, distribution of ice, rate of temperature change in aircraft components, thermodynamic coincidence between laboratory and flight testing, and development and calibration of special instrumentation.

► **E. H. Hall,** design engineer assigned to the tunnel, measures temperature levels on an C-130 wing section. The tested has a net interior capacity of 100,000 liters, provides icing conditions of 0 to 4 degrees per cubic meter, droplet sizes from 5 to 1000 microns.



Thermodynamics Career Opportunities

Increasing development work on nuclear energy, hydro-power and jet transports, radioisotope power sources and space vehicles has created a number of positions for Thermodynamics Engineers and Thermodynamicists.

Lockheed offers you improved salary rates in effect, generous travel and moving allowances, an opportunity to work Southern California, and an unusually wide range of employee benefits, including approximately 14% to each engineer's salary in the form of insurance, retirement pension, sick leave with pay, etc.

You are invited to write E. W. Del Luccio for a brochure describing life and work at Lockheed and an application blank.

E. W. Del Luccio, department head, analyzes test results with Thermodynamics Engineer E. F. Verner (right) and Thermodynamicist Tom Bodenick (left).



LOCKHEED
AIRCRAFT CORPORATION
EL Segundo
CALIFORNIA

News Sidelights

Lockheed's answer to American Airlines' demand for a turboprop transport with shorter range than its L-1049 Super Constellation is expected to be a completely new design, somewhat similar to the Vickers Viscount. Observers expect Convair to come up with an improved four-engine PH, while Douglas often is mentioned as the called "C. R. Smith compensation."

At Foothills opposing U.S. Convair Corp.'s plan to put up a new ghost town March 14, Rawlins, Calif. Roman Dent from the plant may produce serious flying hazards on the approaches to the Strategic Air Command base it says. Brig. Gen. Charles W. Watson, Commander of SAC's 12th Air Division, says visibility at the base has declined steadily in the past 10 years and further deterioration must be prevented if possible.

Government contract for design of a long-and-short-range radar or traffic control center for the U. S. Naval Air Station, Miramar, Calif., has been awarded to Adrián Wilson & Associates, Los Angeles. Project's construction cost is estimated at \$400,000.

North award Powder Puff Derby, the 1935 all-women transcontinental air race from Long Beach Calif., to Springfield, Mass., will be the longest race—2,767 mi. Route will include Phoenix, Tucson, El Paso, Marfa, Wichita Falls, Tulsa, Springfield, St. Louis, Terre Haute, Depew, Wheeling and Reading. Channing a Betty Gable

Second version of Flyrite Helicopter, this one featuring a counter-rotating control system, was flown for first time at Helicopter Forum, Weyog Field, Pa. New model was designed because company received heavy mail asking for standard-controlled version, says sales manager Metal Products Co., Delanco, N.J. Earlier Model A has single control stick.

To avoid recurrence of an accident at Gander, Newfoundland Airport last August, when 77 passengers were not permitted to leave a trans-Atlantic plane that had been diverted there during Hurricane Edouard, airport officials have set aside two rooms in the terminal for use by "quarantine" international travellers. Passengers had to remove their shoes above three hours following the flight from Frankfurt, Germany, because field does not have port-of-entry facilities.



ROCKET MOTORS ON ROTORTIRES of Silvandy HR5-2 in fireproof gear housings, allowing it to exceed 1000 ft performance of conventional HR5-2 in load-grown tires even when carrying 610 lbs. additional load as tested along under the heading. Dots above these numbers mean lower specific thrusts. Bellinger provides fuel for Reaction Motors' engines (National Week Sept. 27, p. 17).

AVIATION CALENDAR

- 10-12-National Science Foundation, third Conference on Scientific Management, Berkeley, Calif.
 11-12-Hoteliers Association of America, annual meeting, Worcester Hotel, Philadelphia.
 13-14-Society of Automotive Engineers annual meeting and engineering show, Sheraton-Cadillac and Grand Statler Hotels, New York City.
 19-21-Milagro International Aerospace, Miami Beach International Airport.
 20-22-Conference on High-Speed Aircraft design, organized by the Department of Aeronautical Engineering at the Polytechnic Institute of Brooklyn, Engineering Science Building, New York City.
 24-27-American Meteorological Society, 11th annual meeting, New York City.
 24-27-The Mandate is Beginning, National Council of Negro Women, Hotel Ambassador, Chicago.
 25-26Meetings for the sensational issues, First annual meeting, House of the Night Dances, Hotel Astor, New York City.
 26-27-International Conference on Free-Radical and Interatomic State Control, Los Angeles Elks Room, College, W. Angeles Calif.
 31-Feb. 4-American Institute of Electrical Engineers, annual meeting, Hotel Americana, New York City.
 4-5-Biology of the Plant Family, U.S. Aridland Plants Division,康奈尔州立大学, Los Angeles.
 9-10-11-Society of American Military Engineers, annual meeting, Hotel Roosevelt, Chicago.
 10-20-Fourth annual Test Appeal and Aviation Conference, AFM College of Test, College Station, Tex.
 11-14-International Association of Space Research, Ninth General Assembly, meeting convened, Hotel Calif., Cleveland.
 18-19-Society of Automotive Engineers annual production meeting and forums, Hotel Plaza, Phoenix.
 24-27-Annual meeting of Test Industries, 1945 annual meeting, Sheraton Astor House, New York City.
 28-Feb. 1-International Congress on Strength of Materials and Structural Mechanics, Auditorium and Auditorium Hotel, Los Angeles.
 1-4-Jan.-Symposium on Boundary Layer Effects in Aerodynamics, British National Physical Laboratory, Teddington, England.
 1-4-World Postage Fair & Trade Exposition, National Council Award, Los Angeles.
 10-Mar. 18-Society of Automotive Engineers Annual Production Forum, Hotel Roosevelt, Los Angeles, Calif., Hotel Statler and McAlpin Hotel, New York City.
 24-25-Second Operation Council, 1945 conference, Olympia Hotel, Newark, N.J.

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Interior Components	311	MAINTENANCE	312	Quality Control
Exterior Equipment	313	MAINTENANCE	314	Facilities
Interior Equipment	315	MAINTENANCE	316	Equipment
Exterior Assembly	317	MAINTENANCE	318	Personnel
Interior Assembly	319	MAINTENANCE	320	Logistics
Exterior Surface	321	MAINTENANCE	322	Information Systems
Interior Surface	323	MAINTENANCE	324	Customer Support
Exterior Structure	325	MAINTENANCE	326	Research & Development
Interior Structure	327	MAINTENANCE	328	Manufacturing
Exterior Components	329	MAINTENANCE	330	Deployment
Interior Components	331	MAINTENANCE	332	Testing
Exterior Equipment	333	MAINTENANCE	334	Technical Services
Interior Equipment	335	MAINTENANCE	336	Planning/Development
Exterior Assembly	337	MAINTENANCE	338	Production
Interior Assembly	339	MAINTENANCE	340	Quality Control
Exterior Surface	341	MAINTENANCE	342	Facilities
Interior Surface	343	MAINTENANCE	344	Equipment
Exterior Structure	345	MAINTENANCE	346	Personnel
Interior Structure	347	MAINTENANCE	348	Logistics
Exterior Components	349	MAINTENANCE	350	Information Systems
Interior Components	351	MAINTENANCE	352	Customer Support
Exterior Equipment	353	MAINTENANCE	354	Research & Development
Interior Equipment	355	MAINTENANCE	356	Manufacturing
Exterior Assembly	357	MAINTENANCE	358	Deployment
Interior Assembly	359	MAINTENANCE	360	Testing
Exterior Surface	361	MAINTENANCE	362	Technical Services
Interior Surface	363	MAINTENANCE	364	Planning/Development
Exterior Structure	365	MAINTENANCE	366	Production
Interior Structure	367	MAINTENANCE	368	Quality Control
Exterior Components	369	MAINTENANCE	370	Facilities
Interior Components	371	MAINTENANCE	372	Equipment
Exterior Equipment	373	MAINTENANCE	374	Personnel
Interior Equipment	375	MAINTENANCE	376	Logistics
Exterior Assembly	377	MAINTENANCE	378	Information Systems
Interior Assembly	379	MAINTENANCE	380	Customer Support
Exterior Surface	381	MAINTENANCE	382	Research & Development
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Exterior Structure	385	MAINTENANCE	386	Deployment
Interior Structure	387	MAINTENANCE	388	Testing
Exterior Components	389	MAINTENANCE	390	Technical Services
Interior Components	391	MAINTENANCE	392	Planning/Development
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Interior Equipment	395	MAINTENANCE	396	Quality Control
Exterior Assembly	397	MAINTENANCE	398	Facilities
Interior Assembly	399	MAINTENANCE	400	Equipment
Exterior Surface	401	MAINTENANCE	402	Personnel
Interior Surface	403	MAINTENANCE	404	Logistics
Exterior Structure	405	MAINTENANCE	406	Information Systems
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Exterior Components	409	MAINTENANCE	410	Research & Development
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Exterior Equipment	413	MAINTENANCE	414	Deployment
Interior Equipment	415	MAINTENANCE	416	Testing
Exterior Assembly	417	MAINTENANCE	418	Technical Services
Interior Assembly	419	MAINTENANCE	420	Planning/Development
Exterior Surface	421	MAINTENANCE	422	Production
Interior Surface	423	MAINTENANCE	424	Quality Control
Exterior Structure	425	MAINTENANCE	426	Facilities
Interior Structure	427	MAINTENANCE	428	Equipment
Exterior Components	429	MAINTENANCE	430	Personnel
Interior Components	431	MAINTENANCE	432	Logistics
Exterior Equipment	433	MAINTENANCE	434	Information Systems
Interior Equipment	435	MAINTENANCE	436	Customer Support
Exterior Assembly	437	MAINTENANCE	438	Research & Development
Interior Assembly	439	MAINTENANCE	440	Manufacturing
Exterior Surface	441	MAINTENANCE	442	Deployment
Interior Surface	443	MAINTENANCE	444	Testing
Exterior Structure	445	MAINTENANCE	446	Technical Services </td

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LETTERS

Lost Plane Signals

I am much concerned every time something happens such as the Northeast Air Line crash in the White Mountains. It seems to me that unless the years there have been few major accidents, it has been too long since we have had the needed plane. To use this is almost unacceptable.

I would like to state the suggestion that Aviation Week suggests the idea of developing an emergency mode to be carried out of all the planes which are operating over land so that each will give off a radio distress signal which can be easily identified. This would enable searching planes to pinpoint the location.

While there are certain difficulties such as what will cause the signal to go off and what frequency pattern should be used, I would sincerely like to locate the source of the signal. I believe that I can come up with positive ideas even there.

First, I would like in general not the fact that if such a signal is set off it would immediately stop the engine. I would suggest that the signal had a duration. The two would not mean operation at a much earlier time.

I believe that the battery people can furnish a battery (dry) located with a battery and switch which would indicate when the signal was set off. I am sure that we could reverse the battery and the signal would go on the air. This is standard practice in the auto industry here. The battery could be of sufficient capacity to operate a signal module for 12 miles or better for a period of 12 to 24 hours. The duration could be made much longer.

ROBERT G. CLEMONS
Circuit Sales Co.
645 Chestnut Street
Wellesley Hills, Mass.

DC-3 Engines

In the Nov. 1 issue of *Aviation Week*, you published a report on the engine problems and maintenance form "KLM's Last DC-3 154-Mph Boom," by George L. Chastain, sponsored by Avianek and Pratt & Whitney Australia, which dealt in particular with KLM's DC-3 engine difficulties in DC-3 aircraft.

After reading this article carefully and with great interest, I have come to the conclusion that either the report published, or the Report itself fall short of adequately describing the problem and the steps taken for the continuation Pratt & Whitney R-985 M2 or DC-3 aircraft.

I make this statement because, judging from the report published, an operator who attended the forum might very possibly leave the forum under the impression that the Pratt & Whitney engines were not up to the job. DC-3 performance is by no means DC-3 engines.

Whether judging from speed, payload more, safety or expense, this is not true, and I hope *Aviation Week* will publish the letter so that all DC-3 operators will have the actual and complete facts regarding the present engine difficulties available to them.

I refer particularly to the Pratt & Whitney K-1180-94 which is referred to mainly in the fourth paragraph of the account published as a 97 version of the 1910. This fine paragraph was apparently actually quoted during the discussion but not placed.

To make the full excellence of that engine, I would like to compare the other objectives of the K-1180-94 with those of the standard K-1180-94 engines.

First, the maximum power output of the K-1180-94 engine is rated at 1,250 hp for normal, 1,250 maximum rpm, except for takeoff, 1,200 maximum rpm, except for takeoff, and 700 maximum cruise rpm. (These figures are taken out of Pratt & Whitney service power curve charts and operating instructions.)

The K-1180-94 develops and are used in METCO and similar high-speed signals in the K-1180-94 engine and are used in the K-1180-94 signal or DC-3 and.

This, in turn, means that a DC-3 equipped with K-1180-94 engines also enjoys inherent running speeds of 200 mph and more, and that its top speeds reach 215 mph, and well within the range of the present speedster one looks. In addition, the K-1180-94 maintains this performance at older takeoff and landing gear weight of 26,980 lb.

On the other points deserve mention. Speedster operates at a rate which the K-1180-94 is also a complete tag along with a wealth of experience behind it.

The Navy has operated thousands of K-1180-94s in PB4Y-2 *Fireballs* since 1943. This aircraft is still in use today for the Navy and Coast Guard. The PB4Y-2, with 16 years in fleet flight, and they have operated and are operating today at great leading efficiency with the loadings we need on DC-3s.

Regarding commercial operations, we are still involved in Old Ca-1000 and Lockheed Lodestar. Since 1942 we have repaired an ever increasing number of airline operations with K-1180-94s and we have accumulated a considerable amount of experience in commercial operations undertaken. We do this now.

In addition, we have accumulated an equally useful K-1180-94 overload and load shedding experience at one stage, through which operations are around of a long-term success.

The final point I would like to bring up is that of cost.

Now KLM's DC-3s will sell approximately \$15,000 each. Thus without paying for spare engines, an operator recovering his DC-3 to K-1180-94s in fixed cost, a jet set and a new engine will be approximately \$15,000 to recover his investment. And the extra cost of aircraft utilization he is required to incur in accomplishing this is not included.

Now K-1180-94s are available on the market for approximately \$16,000 each brought to late specifications, and as an operator recoups his investment whether he is operating his DC-3 or K-1180-94s, he is making a profit.

And at the substantial savings, the operator gets an engine whose life expectancy is isolated again so that it develops 975

METCO hp at 15,000 ft in high flamer (K-1180-94's or K-1180-94's have no high flamer), whereas these K-1180's presently is studied in DC-3's develop only 815 METCO hp at 15,000 ft. This clearly explains why K-1180-94 engine DC-3's durability may claim to and hold 15,000 feet of altitude at maximum gross weight with one 94 horsepower. And this is an indication of the margin of greater power and fuel economy able to DC-3's operation with this excellent Pratt & Whitney powerplant.

There is no opportunity to fly in the picture, even completely on DC-3's power plant alternatives.

With best regards to Aviation Week,
P. H. STEWART, President
Metco Corp., Inc.
17301 South Western
Corona, Calif.

Big Texas Airport

In the airport at Fort Worth (*Aviation Week* Nov. 26, p. 27) only 1,423,000 acres, or 1/3 of the state (approximately 4,300,000 acres) is available for Texas?

ONIA E. COOPER
119-62 Street North
Birmingham 6, Alabama

(Opposite) The photograph of the new Dallas/Ft. Worth airport is for the Nov. 26, 1952, issue of *Aviation Week*. Below is the study before the plan got off the ground (it did). —Ed.)

Praise

Your article on Operation Pope, "Mandingo Chiefs in AA Target," by David A. Anderson, which appeared in the Nov. 15 issue of *Aviation Week* was well written and may be cited as a fine example of factual reporting.

My personal copy of the issue has long since become the property of the project and I should, therefore, like an extra copy of the issue sent.

RONALD J. CONNORS
Naval Personnel
New Mexico College of Agriculture
and Mechanical Arts
Stan College, New Mexico

Gunner Trainer

In the Nov. 15 issue of *Aviation Week* you printed a statement that Illinois Manufacturing Co. and the Air Research and Development Center had developed the F-86D gunner trainer as a long-range target. This is slightly misleading.

Actually, a lead gunner trainer has been developed. The prototype uses an F-86D flight simulator in a flight platform. Other types of flight simulators can be used in flight simulators.

Colonel L. W. Frazee,
Chief, Special Training Division, Defense Department, Personnel & Training Division, DCA/T
Washington, D. C.



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THE STORY BEHIND THE STORY

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